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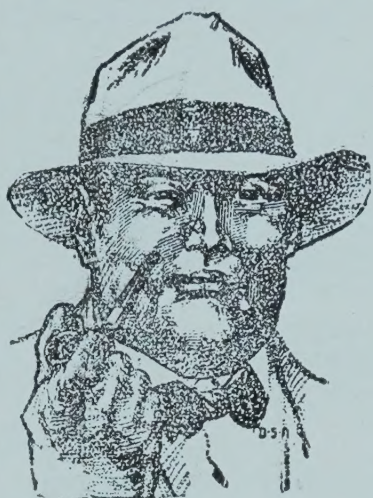
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Volume XXX

Part 1



QUEENSLAND AGRICULTURAL JOURNAL

Issued by direction of

The Hon. the Secretary for Agriculture

.....

Edited by J. F. F. REID

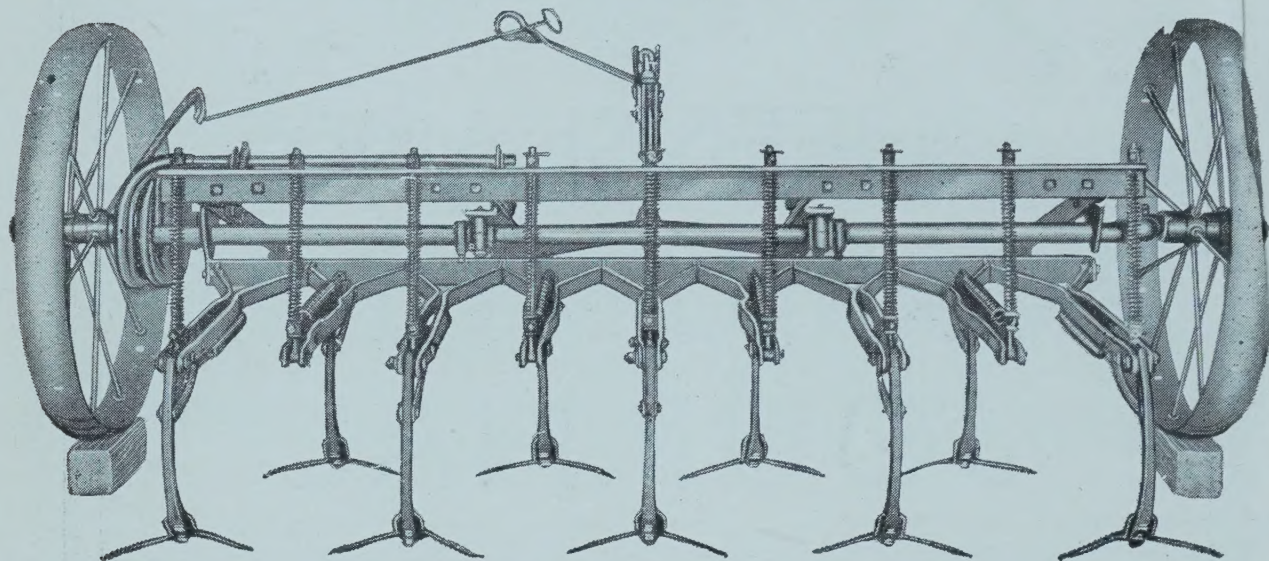
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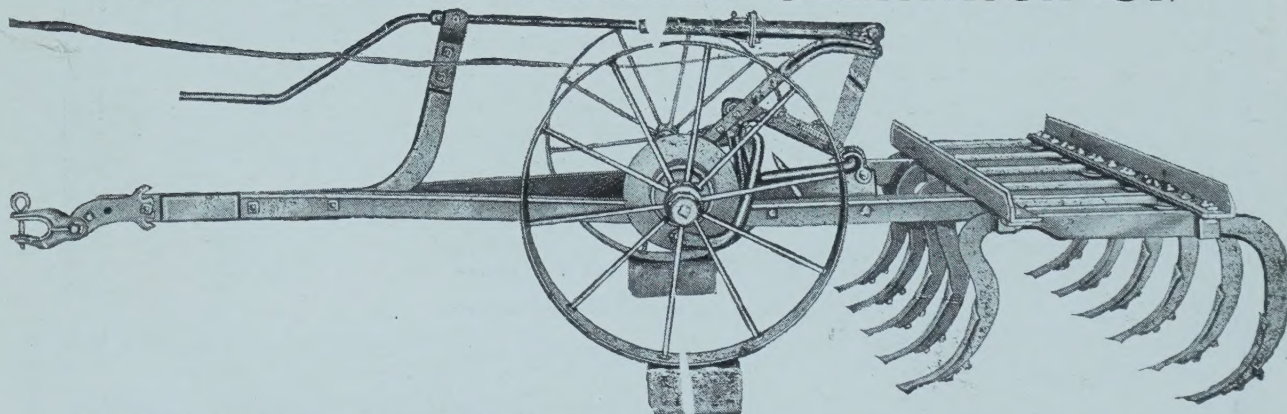
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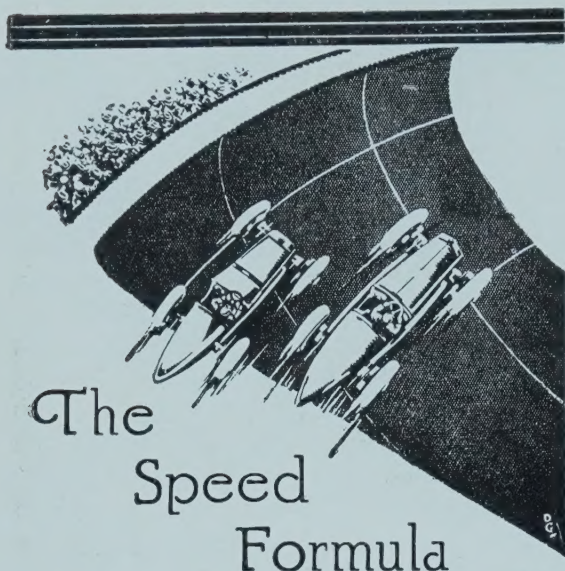
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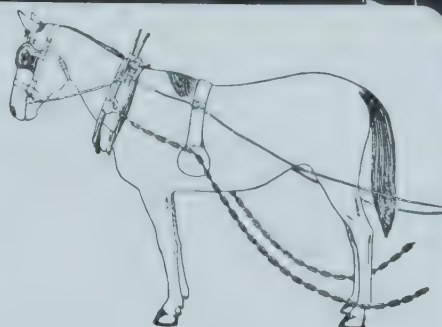
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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXX.

1 JULY, 1928.

PART 1

Event and Comment.

Dairying in Queensland.

IT will be remembered that the Minister for Agriculture and Stock (Mr. W. Forgan Smith) announced last year the appointment of a Departmental Committee to make a survey of economic facts relating to some important phases of agriculture in Queensland. The committee has performed a large amount of useful spade-work, and from the vast quantity of material it has collected much valuable data has been extracted. The Minister decided to issue to producers a series of bulletins containing some of the conclusions based upon this data. The first Bulletin "Dairying in Queensland, No. 1 D.," containing a brief review of the present conditions of the industry, has already been distributed, and the main portion of it was published in last month's Journal. The second bulletin is now available, and the full text of it will be a leading feature of our August issue. In it three outstanding factors are elucidated and stressed: The need of herd improvement, the importance of feeding, and the necessity of herd testing. The bulletin not only sets these out as meriting the immediate attention of those engaged in dairying in this State, but also extends a standing invitation to them to take advantage of the helping hand of the Department, and of the facilities which it offers. Facts and figures are cited in support of herd improvement, and particulars of the Better Bull Scheme are also given. The importance of feeding is emphasised, and a list of dairy fodder crops recommended for use in Queensland, together with particulars of their cultivation, are set out. Herd testing, as carried out by officers of the Department, is reviewed, and many cogent and impressive facts are pithily presented. The dairymen of Queensland

are asked to avail themselves of the services which are at their disposal free of any charge. They are also invited to set before themselves the reasonable objective of raising the average annual yield per cow to 260 lb. commercial butter. The attainment of this objective obviously means a greater measure of prosperity to all concerned, and to reach it there should be no difficulty in securing the co-operation of all engaged in the industry.

Queensland Butter Factory Successes.

THE Deputy Premier and Minister for Agriculture (Mr. W. Forgan Smith) followed with much interest the reports of the proceedings of the Queensland Butter and Cheese Factory Managers' Association Conference which was in session at Brisbane last month. Efforts to improve the standards in the dairying industry generally, and on the manufacturing side in particular, were, he informed the Press recently, worthy of commendation. Evidence of this he observed in some recent successes achieved by Queensland manufacturers in important competitions, in which the butter and cheese of other States have been exhibited.

In the first competition for the World's Butter Championship, conducted at the Auckland Winter Show in August, 1925, the Oakey District Co-operative Factory secured second place with 96 points, the first prize gaining 96½ points.

At the Royal Melbourne Show last year Queensland factories secured these awards:—Salt butter, suitable for export, won by Oakey District Co-operative Butter Association. The champion prize for cheese of any age, judged on flavour, was awarded to the Pittsworth Dairy Company (Yarranlea factory). The same company took first place in the class for cheese suitable for export, not over three months. The Downs Co-operative Dairy Association (Lillydale factory) was second. The judges stated that the quality of the Queensland butter was very fine, and reflected great credit on the manufacturers and the standard of efficiency attained by the factory managers. In connection with the competition of Australian butters entered in the Orient Line Jubilee Export class, in which sixty-one factories competed, recent cable advices from London indicate that the Downs Co-operative Dairy Association (Goombungee factory) tied with the "Norco" Corndale factory (N.S.W.) for the highest aggregate points in the Sydney and London judgments in both salted and unsalted classes. In the salted classes Queensland Farmers' Co-operative Association (Grantham factory) came second with 191 points, while the Goombungee factory also secured fourth place with 189½ points in conjunction with the Uki (New South Wales) factory. In the unsalted classes the Maryborough Co-operative Dairy Association (Kingaroy factory) shared second place with the "Norco" Company's Channon factory (New South Wales), while the Downs Co-operative Dairy Association (Goombungee factory) was equal for fourth place with two other New South Wales factories.

To enable the industry to secure the full benefits of the improvements being effected on the manufacturing side, added the Minister, there must be complete co-operation by the farmer with the factory, for in order to produce the highest quality butter and cheese it is necessary that the producer should supply cream and milk in the best possible condition. He complimented the Manager's Association on its activities and for its efforts to further improve manufacturing standards.

Colour Prejudice in Corn.

THE Director of Agriculture (Mr. H. C. Quodling) has informed us that the proportion of red-tinted and red-coloured maize being marketed this season in Southern Queensland is so pronounced that buyers, who are on the lookout for yellow grain, have experienced great difficulty in getting even, whole coloured lines. The prejudice against this red-coloured grain is not confined to the interstate trade, as it is understood that distinctly coloured yellow grain is also being sought after for the overseas trade. Actually, there is little or no difference in quality between red and yellow grain. Growers, however, would be well advised when selecting their seed corn for the approaching season's planting to make sure that it is a whole coloured yellow variety. If action in this direction were general, there would be fewer complaints by buyers and better and more satisfactory marketing conditions could be anticipated in the future. It is hardly necessary to stress the importance of everyone concerned assisting in the "swing over" from red to yellow coloured grain, and in this direction the helpful efforts of seedsmen would be invaluable. A word of warning in relation to the source of seed supplies may not be out of place, so that diseases not known now in Queensland may be kept out. One serious disease

coming under this category is known as "root, stalk, and ear rot," which is readily set up by infected grain. Loss from this particular disease in New South Wales alone has been estimated on occasion as from 5 to 10 per cent., and it is practically impossible to tell whether or not apparently sound, healthy-looking grain is free from infection.

The Position of the Sugar Industry.

A SURVEY of last year's operations generally reveals the present position of the sugar industry in Queensland. With the exception of that of 1925 the 1927 crop was the best yet harvested. The Statistician's figures for the term are not yet available, so the results now given must be regarded as approximate only. The present embargo on imported sugar expires next month, and the Federal Government has determined that it shall be renewed for a further term of three years as from August, subject to the same prices and conditions that obtain under the existing embargo. This was essential to the Queensland industry, and its renewal gave the greatest satisfaction to all sections employed in it, besides winning the approval of all who take the long view of national affairs.

In 1927 the total area under cane was just about 300,000 acres, an acreage considerably in excess of that of the previous year. The area from which cane was crushed was 211,762 acres, also an excess over the 1926 figures by 22,450 acres. The total tonnage of cane harvested was 3,554,289 tons, from which it is estimated that approximately 483,000 tons of 94 n.t. raw sugar were extracted. This yield was much higher than that of 1926, exceeding it by 94,000 tons. It was just short of the 1925 record, which was 485,585 tons. The acreage yield was about 16.7 tons, as compared with 15.45 tons per acre in 1926. The sugar yielded per acre, 2.2 tons, was also better than that of the previous year. The quantity of cane required to make 1 ton of sugar was about 7.3 tons, which was the lowest on record, the commercial cane sugar in the product last year being particularly good. In this factor much improvement has been shown in recent years, which is due to the higher efficiency of the raw sugar mills, better varieties of cane, the regulation of cane prices, and the work of the Bureau of Sugar Experiment Stations. The excess of the sugar produced over home needs amounted to 152,400 tons. The price paid to the mills was £22 0s. 4d., or £2 10s. 6d. less than in 1926. The percentage which went into home consumption was 68.8181, while the net value of the sugar exported was £12 2s. 6d. per ton n.t. The estimated consumption in the Commonwealth is somewhere around 333,000 tons per annum. There is no information at present available on the molasses output, but it is anticipated that, with power alcohol plants operating at Sarina and elsewhere, this will be an important industrial and economic factor in the near future.

The Present Seasonable Outlook.

THE present sugar season has opened out very promisingly, and it is expected that the 1925 record should be exceeded. Grub damage, however, has been severe, particularly in the North, and grubs have also appeared in districts hitherto regarded as quite free from the pest. Their prevalence this year is due largely to congenial seasonal conditions. The Bureau of Sugar Experiment Stations, which is part of the excellent organisation which is characteristic of the whole industry in Queensland, is extending somewhat its beneficial influence. Its staff of trained men has been largely increased, and the services of student scientists who were sent abroad as the holders of Travelling Scholarships are now available to the growers and millers. Of the travelling scholars two, Messrs. Bell and Bennett, whose work has been in cane pathology and sugar technology respectively, are now actively employed. A third, Dr. Kerr, whose oversea studies have taken in soils physics and chemistry, is expected to return this year. The work of these young and gifted Queenslanders should be of the greatest value to the industry.

The propagation of new seedling canes is being carried out on an extensive scale, and this activity is of the utmost importance to the farmers. The new canes are, of course, tested for their commercial value as well as to their resistance to disease.

In respect to general educational guidance, the Queensland sugar-grower has very little to complain about, and probably no primary industry in Australia is so well advanced along the lines of scientific organisation. This is as it should be, and, in fact, the sugar-growers have set a high standard and an impressive example to farmers in the other departments of rural enterprise.

Bureau of Sugar Experiment Stations.

FERTILISER RESULTS AT BUNDABERG.

The following data on the use of fertilisers in sugar-cane cultivation have been supplied by several Bundaberg farmers to the Bureau of Sugar Experiment Stations, and in every case show a profit that has well paid the grower for manuring. These are the results of local experiments that have been mentioned by Mr. J. C. Murray, Southern Field Officer to the Bureau, in his reports from time to time. As the growers concerned have requested that their names should not be mentioned, a distinguishing letter is affixed to the various examples:—

FARM A, BUNDABERG.

Soil, red scrub loam. Cane value at mill, 37s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Values of Crop due to Fertilisers.
Bonemeal, 6 cwt.	25.0	5.0	£ s. d. (a) 5 8 0 (b) 0 5 0 5 13 0	£ s. d. 3 12 0
Sulphate of Potash, 3 cwt. ..				
No Manure	20.0	..	..	..

FARM B, BUNDABERG.

Soil, red scrub loam. Cane value at mill, 37s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(a) Cost of Manures and (b) Application.	Increase in Value of Crop due to Fertilisers.
4 cwt. Mixed Manure containing— 9% Nitrogen	22.0	4.0	£ s. d. (a) 3 4 0 (b) 0 0 5 3 9 0	£ s. d. 3 19 0
7% Phosphoric Acid (as bone)				
11% Potash as Muriate				
No Manure	18.0	..	..	..

FARM C, BUNDABERG.

Soil, red forest loam. Cane value at mill, 36s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
4 cwt. Bonedust	20.0	2.0	£ s. d. (a) 2 0 0 (b) 0 5 0 2 5 0	£ s. d. 1 7 0
No Manure	18.0	..	..	..

FARM D, BUNDABERG.

Soil, red forest loam. Cane value at mill, 36s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
3 cwt. Bonedust and 1 cwt. Sulphate of Potash	22·0	4·0	(a) 2 8 0	4 11 0
.. ..			(b) 0 5 0	
No Manure	18·0	..	2 13 0	..

FARM E, BUNDABERG.

Soil, red forest loam. Cane value at mill, 37s. per ton.

Manures Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
4 cwt. of Mixed Manure, containing—	20·0	5·0	(a) 2 10 0	6 10 0
3½% Nitrogen			(b) 0 5 0	
12% Phosphoric Acid (as bone and superphosphate) ..			2 15 0	
12% Potash (as sulphate) ..	15·0	..	..	..
No Manure .. ..			..

FARM F, BUNDABERG.

Soil, red forest loam. Cane value at mill, 37s. 6d. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
4 cwt. of Mixed Manure, containing—	20·0	5·0	(a) 2 17 6	6 5 0
7% Nitrogen			(b) 0 5 0	
10% Phosphoric Acid (as bone)			3 2 6	
10% Potash (as muriate) ..	15·0	..	..	..
No Manure .. ..			..

THE BUNDABERG EXPERIMENT STATION AND THE GUMMING DISEASE SITUATION.

The Bureau of Sugar Experiment Stations has issued the following report:—

In common with most other farms in the Bundaberg district, gumming disease became established on the Bundaberg Experiment Station a few years ago. The result has been that the hitherto standard varieties have suffered great losses in both tonnage and purity, and have reached the stage where it is impossible to continue to grow these varieties profitably. In order to cope with this situation the Director, in 1926, ordered the ploughing out of all susceptible canes, and their replacement with resistant varieties. Of the latter, Q. 813 appeared by far the most promising, and has accordingly been planted extensively, and is now the main variety on the Station; the only other varieties grown are those which are being tested for resistance to gumming.

Cane may be infected with gumming in a variety of ways, but by far the most important mode of spread is from leaf to leaf during wet windy weather (see an article by Mr. D. S. North in the "Australian Sugar Journal" for August, 1927). The causal bacteria enter the leaves through wounds in the epidermis, and after about two weeks the typical yellowish streaks appear on the leaves. The zone of infection may remain confined to the leaves, but in susceptible varieties it extends down into the stem as soon as the cane receives a check in growth—i.e., during the winter or drought periods. Once the disease has passed into the stem it becomes systemic, and it is in this comparatively late stage that the gum oozes from the cut ends of the stem. There are no commercial canes known to be immune to gumming, but there are a number which are highly resistant, and which, if exclusively grown, would soon serve to eradicate the disease from the district. Q. 813 must be placed in this class of highly resistant canes. When exposed to sources of heavy infection this type of cane will contract the disease, but, apart from exceptional circumstances, the infection is confined to the leaves and does not pass down into the stem. The disease thus fails to become systemic, and the cane should become completely healthy with the shedding of the infected leaves. Since gumming is spread only in wet windy weather, it follows that during a period of dry calm weather there would be no secondary spread, and a crop of a highly resistant cane would soon tend to become quite healthy again. The bacterium which causes gumming appears to live only in the sugar-cane plant, and cannot live in the soil or trash. From these considerations it will readily be understood that gumming could be eliminated from the Bundaberg district if every farmer grew canes which are highly resistant and those canes only. Strict attention must be paid to the eradication of the small collections of nondescript varieties which are found on most farms. After the elimination of the disease it should then be possible to return to the old susceptible varieties if that were desired.

The extensive plantings of Q. 813 will be harvested at the Station this year, and it is confidently expected that the experiment will prove the possibility of growing a comparatively healthy crop of a resistant cane even when surrounded by badly diseased fields. As long as the growers immediately adjacent to the Station continue to plant susceptible varieties it will be impossible to maintain the Station fields in a disease-free condition, as it is known that the causal bacteria are carried by flies over considerable distances. It must be emphasised here that all attempts at the control of gumming should not be sporadic but must be practised simultaneously over the entire district.

Unfortunately, the problem of securing resistant varieties which are suitable for the particular class of soil is exceedingly difficult in some sections of the Bundaberg district. Q. 813 is quite unsuitable in some areas, but should be grown wherever possible, as, in addition to being highly resistant to gumming, it is also resistant to Mosaic and Fiji diseases. The Bureau has recently imported from the West Indies two canes which there are resistant to gumming, and yield high tonnages of sugar; these will soon be available for field tests at the Station. In March a shipment of the famous Java cane (P.O.J. 2878) was received; Javanese experience suggests that this cane should do well under somewhat adverse conditions, but naturally nothing is known of its resistance to gumming. Arrangements have been made to introduce a number of specially selected canes next spring; the parentage of these canes leads us to believe that the majority of them should prove resistant to gumming. In addition, a number of the South Johnstone seedlings are already undergoing field tests for gumming resistance, and several varieties are showing promise.

Next year it is hoped to extend the breeding programme of the Bureau, and special attention will be paid to breeding canes for the double purpose of gumming resistance and tolerance of unfavourable climatic conditions.

THE ATHERTON TABLELAND.

Mr. J. H. Buzacott, Assistant Entomologist to Mr. E. Jarvis, Entomologist of the Bureau of Sugar Experiment Stations, reports:—

Atherton Tableland was visited in order to make a study of the insect pests affecting sugar-cane growing in the district, and also with a view to comparing pests found there with those occurring at lower altitudes.

Unfortunately, wet weather was experienced throughout the whole duration of the visit (March, 1928), and thus little opportunity was afforded for the collection of a representative group of insects.

There is very little cane grown on the Tableland now, although many of the farms have a small patch for feeding pigs and stock, but most of this was poorly

cultivated, and Mosaic was common. On account of the small plots of cane insect pests were also collected from nearby maize, but the number of serious pests encountered was few.

The chief insects met with are listed below:—

Orthoptera.

Grasshoppers were doing the most damage, mainly *Locusta danica*, *Locusta australis*, and a thin long-legged green grasshopper which was far more prevalent on the Tableland than on the coastal lowlands.

The common cane cockroach (*Ellipsidion* sp.) was on the cane and corn in large numbers.

Army Worms.

Various species of army worm caterpillars were collected, and among the adults bred out have been *Cirphis unipuncta* and *Mocis frugalis*.

A fungus disease was found to be attacking many of the caterpillars there—this disease somewhat resembling the green muscardine fungus (*Metarrhizium anisopliæ*) which attacks cane grubs and other insects.

Other Pests.

Aphides were present in large numbers on the maize, whilst on surrounding grass land the small black leaf-eating beetle (*Rhyparida morosa*) was very numerous.

Judging by the presence of click-beetles in the corn, their larvæ, known as wire-worms, were probably operating at the roots.

Specimens of a skipper butterfly (*Parnara mathias*) were captured in cane, and also two larvæ of it, one of which was parasitised by a Braconid wasp, were found on cane leaves. This skipper has been recorded before as attacking sugar-cane in North Queensland.

Among the beneficial insects observed were male digger wasps (*Campsomeris* sp.), Robber flies, and earwigs.

As stated above, on account of the wet weather, this could hardly be termed representative of the Tableland insects, and of those specimens collected or seen there was not one species which is not known to commonly occur on the lowlands in the Cairns district.

CANE CULTURE IN THE PHILIPPINES.

By ARTHUR F. BELL.

The Philippines constitute a large group of islands lying to the south-east of continental Asia, and extending from latitude 4 degrees north to 20 degrees north. The group contains over 1,400 islands, with an aggregate area of over 120,000 square miles. The native population is of the Malayan race, and has many characteristics in common with the Javanese; the type of native and the dialect spoken vary somewhat as one passes from island to island. In the sixteenth century the Philippines came under the domination of the Spaniards, and the Spanish rule persisted until the Spanish-American war of 1898, when the group became an insular possession of the United States. Since that time the development of the country has been greatly accelerated, due to the introduction of American system and capital, and the exemption of Philippine products from payment of the heavy import duties of the United States. With the exception of the very small islands of Porto Rico and the Hawaiian group, the Philippines constitute the sole tropical possession of the United States, and as such are of great importance to that country. It is well known that continental United States is dependent upon other countries for its enormous requirements of coffee and rubber, and to a large extent sugar, and the Philippines are potential suppliers of the entire needs of these tropical commodities.

Economic Conditions.

Although sugar-cane has been grown commercially for very many years, the Philippine industry must be considered as being in the infancy of its development. Only a small proportion of the available land is at present devoted to cane culture, and this land is confined to the two islands Luzon and Negros, the latter being the

more important. For the season 1926-27, the total production was nearly 500,000 tons of raw sugar, the greater part of this being exported to the United States. There has recently been some agitation to persuade the United States Congress to limit the quantity of Philippine sugar which shall be admitted duty free, and the amount suggested was 500,000 tons. Should this proposal come into effect, it will naturally be a serious blow to the future of the Philippine sugar industry. On the other hand, next to Java, the labour is probably the cheapest in the sugar world, and the profitable production of sugar should soon be achieved even without the assistance of the American tariff barrier.

Cane Varieties and Yields.

To achieve this end it will be necessary to bring about an almost complete change-over in the varieties of cane grown. At the present time the bulk of the crop is composed of the so-called "native" canes, Luzon White, Luzon Red, Cebu Purple, Negros Purple, &c., canes which yield neither heavy crops nor rich juices, and which cannot be ratooned successfully. It seemed to me that the yield per acre could probably be increased by at least one-third, merely by the substitution of varieties which are already in the country. Moreover, these varieties will yield two or three ratoon crops, thus eliminating the necessity and cost of planting every year. Of these new varieties, Badila is one of the most promising varieties being grown on the island of Negros, and is giving an average yield (both plant and ratoon) of about 25-30 tons per acre for a twelve months crop. Whether Badila will become the standard variety, or whether it will be but a transition variety while other varieties are developed and tested, remains to be proved.

Exhaustive tests of the yielding capacities of different varieties are now being carried out under the direction of H. Atherton Lee, late Chief Pathologist to the Hawaiian Sugar Planters' Association, and now Director of Research to the Philippine Sugar Association. In addition to his high scientific attainments, Mr. Lee is equipped with sound practical knowledge and judgment, and I consider that the experiments which he has just set out promise to be among the most thorough which I have ever seen in any sugar-cane country. His current programme consists of at least one variety trial and one fertiliser trial in the lowlands and uplands of each mill district. Each experiment is laid out so that there are ten plots of the control and ten plots of each of the experimental treatments. Each plot occupies an area of a quarter acre; these will be harvested separately, the results examined mathematically, and the true significance of any differences in results ascertained. After the standard varieties and the best fertiliser practices have been determined, the programme will be extended to include experiments on cultural operations, &c.

Farm System.

Unlike Java and Hawaii, the industry is not conducted on the estate system, but approximates to the farm system of Australia. The mill owns the permanent tramways, hauls the cane from the tramway siding, and is responsible for the allocation of cane cars to the individual farmers. At the beginning of the season an estimate is made of the total yield, and of the probable yield for each farm, and on this basis each farmer is allotted so many cars per day. This means, of course, that harvesting is going on each day on practically every farm. Each car is weighed as it comes into the mill and as a general rule the farmers are paid on the basis of 55 per cent. of the value of the sugar extracted from their cane, the mill retaining 45 per cent. Until comparatively recently the Calamba Sugar Company ran their properties on the estate system, but have now subdivided into farms of 15 acres, which are leased out to the Filipinos. This type of farmer is called an *Aparcero*, and pays a fixed rent according to the quality of his land; he may provide his own animals and implements, or these may be leased from the company. The company pays the *Aparcero* a flat rate of about £13 per acre for plant cane, providing the returns are up to standard; for every ton over 20 tons per acre on first-class land, and 18 tons on second-class land, the *Aparcero* receives a bonus. The contracts dealing with the leasing of the land specify that the *Aparcero* must do certain amounts of weeding and cultivation. The estate is divided up into a number of divisions, and in each division there is one farm set aside for experimental and demonstration purposes.

Climatic Conditions.

The two islands of Negros and Luzon differ considerably in so far as their climates are concerned. Although the total rainfalls are of the same order, the distribution is more even on Negros, and there is not the pronounced dry season to be found on Luzon. There are small irrigation schemes for the purpose of

growing rice—the staple food of the country—but all cane is grown under the conditions of natural rainfall. The planting season is during the dry months, and this is no doubt one of the reasons why Badila is not grown with much success on Luzon. It is the general practice to use top seed; special gangs go in one or two days ahead of the canecutters, and top the cane, so that planting and harvesting must be carried out at the same time. In some places the seed is soaked in water for about twenty-four hours before planting, but the majority of farms have not the facilities for doing this. (With reference to this practice, it is interesting to note that in Java, where hot water treatment of seed was beginning to be adopted for the control of sereh, it was advised that the seed should be dried for twenty-four hours after this treatment.) It is claimed that if top seed is well covered with trash it will keep in good condition for a period of about three weeks. Owing to the weed problem, the cane is planted very closely and some 10,000-12,000 seed pieces are used per acre. Since this is all top seed, and since a good proportion of the cane tops are unsuitable for seed (e.g., cane which has arrowed), it will be evident that many areas suffer from a shortage of seed. One of the natural results is that seed selection against such diseases as mosaic is rendered difficult, and it is becoming necessary for a certain amount of body seed to be used in order to permit of the necessary seed selection.

The comparatively high rainfalls are responsible for the rapid growth of weeds, and the control of these presents a serious problem, especially on Negros, and represents a considerable item in the costs of production. In order that the cane will close in as quickly as possible, it is the practice to place the rows only about 4 feet apart.

Methods of Cultivation.

Tractors are not in wide use, except on the Calamba Estate, but their numbers are increasing; on Calamba the tractors are owned by the estate, and the ploughing is done for the Aparcedo at approximately cost rates. At present, most of the cultivation is done with small native ploughs drawn by caribao (water buffaloes), and while the rows are spaced only 4 feet apart, it is unlikely that light tractors can be used successfully for cultivating between the rows. It is the custom to burn off all trash, but fallowing is practised to some extent, and the use of artificial fertilisers is increasing each year. Recent experiments on the Calamba Estate have demonstrated the advantages of cultivation for ratoons immediately after the cane has been cut. The management has now made it a rule to cultivate with a disc harrow within two days of harvesting; this is done diagonally across the field twice and then off-barring is carried out as soon as possible, and at least within two weeks. From the standpoint of cultural methods, the limiting factor in the Philippines is undoubtedly the very poor drainage found in most parts of the islands, standing water being a common sight even after only moderate falls of rain.

Diseases and Pests.

Although a large proportion of the more serious sugar-cane diseases is present in the Philippines, nevertheless, the aggregate loss due to disease does not appear to be very great, except in the districts heavily infected with mosaic. Whether this condition will continue in the face of the change-over to sweeter varieties of cane is another question, but no doubt adequate tests will be made for disease resistance before the planting of any particular variety is advised. Leaf-scald, mosaic, Fiji, smut, and Bunga are the most important diseases present; downy mildew was found on one property in 1921, having been introduced from Formosa, but now appears to have been eradicated by roguing.

Field Experimental Work.

Most of the field experimental work is conducted under the supervision of the technical staff of the Philippine Sugar Association; this organisation has no experimental station at present, but there is little doubt that one will be established in the near future. In addition to the Director, there is a superintendent on each island and an experimentalist attached to each mill, the latter being responsible for the detailed supervision of any experiments. The Philippine Bureau of Science has been responsible for a considerable amount of work with sugar-cane, especially in sugar-cane pathology. The College of Agriculture at Los Banos provides courses in agriculture, and the technology of sugar manufacture, and has a well-equipped model mill for the instruction of the students. Excellent contributions to tropical pathology have been made from this department of the college. The Genetics Department is carrying out an extensive programme of seedling raising, this being

the only cane-breeding station in the islands. The method of crossing is similar to that adopted in India, i.e., the stalk of the male parent is surrounded by a bamboo cylinder containing soil, and after the production of roots in this soil the stalk is cut off below the cylinder and the rooted stalk and arrow are carried to the female parent which is left growing in the field. Some 50,000 seedlings are germinated annually in flats in the open air, and about 2,000 of these are selected when 12 to 18 inches high, and are then planted out in the field and selected at maturity on the basis of visible characters, weight, and analysis.

Labour Conditions.

The situation with regard to labour is somewhat paradoxical, since the Philippines are "exporters" of indentured labour to the sugar fields of Hawaii and yet most of the Philippine sugar districts suffer from a shortage of labour. This situation arises from the fact that the island of Negros is very thinly populated, and the natives of the neighbouring islands are somewhat averse to leaving their homes for seasonal work. On the other hand they are quite ready to be transplanted to Hawaii where they are assured of continuous work and a wage of about 5s. per day as compared with about 1s. 6d. per day in the Philippines. However, this labour shortage is never likely to be a very serious factor, and the situation will no doubt improve from year to year.

In conclusion, it must be stated that, pre-supposing the continuance of some measures of protection and freedom from serious political strife, the future of the Philippine sugar industry appears to be exceptionally bright.

FIELD CROPS FOR DAIRYMEN.

"I wish that we could get all dairy farmers to realise the advantages to be gained by the growing of wheat, oats, or barley with field peas or vetches, as a means of providing a succulent feed that will be available from August to October, in Queensland," said Mr. A. E. Gibson, Instructor in Agriculture, recently.

"We have prepared a booklet illustrating crops that have been grown, and giving full particulars as to sowing and yields. The Department will be glad to send a copy to any reader of the Journal.

"We have found that 'Prince' and 'Patriot' wheats and 'Skinless' and 'Cape' barley do wonderfully well. So does Ruakura oats.

"In an experiment at Beaudesert, the varieties of wheat—'Prince' and 'Patriot'—made excellent growth, having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

"During the early stages of growth, the barleys suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape barley made most remarkable growth, but that of 'skinless,' subsequent to the first cutting, was somewhat thin.

"The sowing at Beaudesert was made on 16th May. That is rather late. Earlier sowing would be better. We got 18 tons 18 cwt. of Ruakura oats and peas, and 15 tons 2 cwt. of Cape barley and vetches.

"On Mr. A. Hulse's farm at Yandina we got a yield of 16 tons 16 cwt. of 'Prince' wheat and peas, and 12 tons 3 cwt. of Cape barley and peas. These are good yields on rich, alluvial country."

Mr. Gibson recommends the following quantities of seed per acre:—

Wheat, 30 lb., Dun field peas or Black Tares, 20 lb.

Barley, 40 lb., Dun field peas or Black Tares, 20 lb.

Rye, 30 lb., Dun field peas or Black Tares, 20 lb.

Oats, 30 lb., Dun field peas or Black Tares, 20 lb.

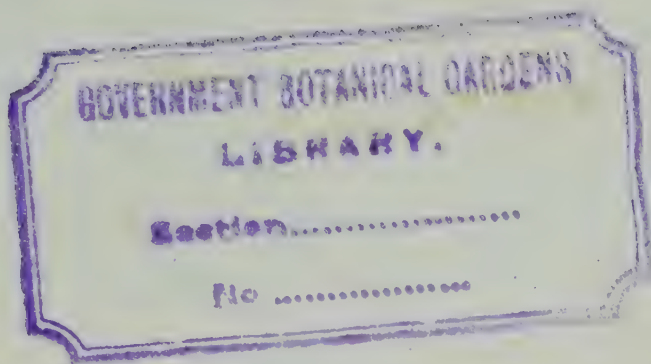
Canary seed, 10 lb., Dun field peas or Black Tares, 20 lb.

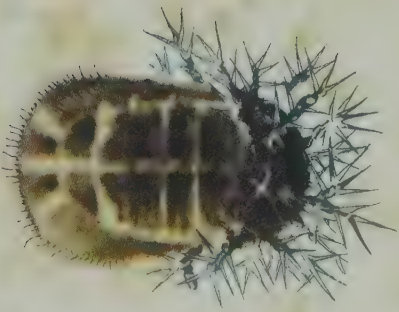
Wheat, alone, 60 lb. per acre.

Barley, alone, 50 lb. per acre.

Oats, alone, 40 lb. per acre.

Rye, alone, 60 lb. per acre.





THE LEAF-EATING LADYBIRD.

By MARGARET E. TEMPERLEY, B.Sc., Entomological Branch.

Every year the Department of Agriculture and Stock receives numerous reports concerning the depredations of the leaf-eating ladybird, *Epilachna 28-punctata* Fab., a small beetle belonging to the family Coccinellidæ. Last year was no exception, and in November and December the Chief Entomologist advised many inquirers concerning the control of this pest.

In late spring and early summer the beetle appears in large numbers, causing extensive damage to crops produced by the farmer and market gardener, both larvæ and adults feeding on the leaves of the host plant and in cases of gross infestation resulting in complete defoliation.

The various stages of this insect were described by Olliff² in 1890, but no detailed work appears to have been published regarding its life history. Accordingly, at the suggestion of Mr. Veitch, a brief study of this insect was commenced in December, 1927, and as a result some additional information has been obtained regarding the life cycle stages of this pest, the details of which are recorded in these notes.

Geographical Distribution.

Epilachna 28-punctata has been recorded as occurring in China, Japan, India, Ceylon, the Philippine Islands, the Malay Archipelago, New Guinea, Australia, and Fiji. In Australia it flourishes in the warmer parts, extending from New South Wales through Queensland to the Northern Territory.

Food Plants.

The widespread distribution and abundance of this beetle is due to its ability to change readily from one food plant to another. Among cultivated plants in Australia, potatoes, tomatoes, and pumpkins are more commonly attacked, while cucumbers, cotton, and rockmelons are also infested. *Solanum nigrum* or Nightshade and *Datura stramonium* or Trumpet Flower are the two most common weeds which serve as food plants for this pest, while it is also found feeding on many other solanaceous and cucurbitaceous plants. In other countries tobacco and egg-plant are recorded as hosts.

Nature of Injury.

As is well known the majority of the Coccinellidæ or ladybird beetles are beneficial insects, and are worthy of protection on account of the fact that in both the larval and adult stages they are predatory on aphids and scale insects. A few species belonging to the Epilachminæ, however, are plant feeders, and cause much damage to crops.

In the species under consideration both larvæ and adults are vigorous feeders, the larvæ exhibiting a marked preference for the under surface of the leaf, while the adults are found feeding on both

surfaces. Ragged patches are eaten out of the leaf, leaving a thin film of cuticle on the opposite side (Plate 1, Fig. 5). The adults frequently eat right through the leaf. A badly damaged leaf has a lace-like appearance, the tissue of the leaf being eaten away in patches, the patches being fairly close together with narrow intervening strips of undamaged tissue. A few of these insects feeding on the leaves merely retard the growth of the plant, but when present in large numbers defoliation may take place and the plant may die. Cases of severe infestation have been recorded where even the denuded stems were completely destroyed.

General Description and Life History.

In completing its life cycle this insect passes through the following different stages:—(1) The egg, (2) the larva, (3) the pupa, and (4) the adult.

The Egg.

The egg of this beetle is cigar-shaped, yellow in colour, and measures about one-sixteenth of an inch long (Plate 1, Fig. 1). The surface is hexagonally sculptured. Oviposition takes place during the day, the eggs, in the cases observed in this investigation, being laid in clusters on the under surface of the leaf. In clusters taken in the field, from 13 to 45 eggs were found in each, while in the laboratory the number of eggs per cluster ranged from a minimum of 9 to a maximum of 32. The details of the latter are shown in Table II.

The incubation period of the egg in the cases observed, remained remarkably constant at four days. The first signs of development are visible on the third day, when the ocelli or eyes of the larva can be seen at the apex of the egg with the aid of a lens. On the fourth day, the top of the egg becomes ruptured and the young larva emerges, clinging to the empty eggshell or remaining near the hatching site for several hours before wandering off in search of food.

The Larva.

The larva is yellow bodied and presents a rather formidable appearance, being clothed from the region of the head to the posterior extremity with stiff branched spines (Plate 1, Fig. 2). The spines are light coloured with dark-brown tips. The larva increases in size by a series of moults, whereby the old skin, which has become too small for the larva, is cast off and is replaced by a new and larger skin which formed underneath the old one. Four such moults occur in the larval stage. The duration of the larval stages is given in Table I. A somewhat technical description of the larval instars is given after the discussion of control measures.

The full-grown larva measures about three-eighths of an inch long and the rectangular areas surrounding the base of the spines are defined with dark-brown thickenings, which become more pronounced as the larva approaches pupation.

When disturbed the larva secretes drops of bright yellow fluid. The mature larvæ are gregarious and gather together on the stems and under surfaces of the leaves prior to pupation.

About two days before pupating the larva enters its prepupal stage, becoming attached to the stem or leaf at its anal extremity by means of a viscid secretion. It ceases feeding and the body becomes shorter and broader. The duration of the larval period averages nineteen days, the maximum and minimum periods being twenty-three days and seventeen days respectively in the cases under observation.

The Pupa.

The pupa (Plate 1, Fig. 3) is oval in shape and measures about one-fourth of an inch long and three-sixteenths of an inch wide. It is attached at its posterior extremity to the under surface of the leaf or stem. The body of the pupa is creamy coloured with dark-brown markings. The last larval skin with its stiff spines covers the posterior segments of the abdomen. The insect remains in the pupal stage four days, at the end of which the pupal skin splits and the adult emerges.

The total life cycle period from egg laying to the emergence of the adult averages twenty-seven days in summer. The full details are given in Table I.

Adult or Beetle.

The newly-emerged adult (Plate 1, Fig. 4) is bright yellow and is devoid of dark markings. The body is extremely soft, but on exposure to the sun and air soon hardens and after half an hour or so the spots can be seen very faintly. These become more pronounced until finally within a couple of hours after emergence they are densely black, while the ground colour has changed to a yellowish-brown.

The beetle is oval in shape, being broadest in the region behind the head and having the extremity of the abdomen more or less pointed. The under surface is flat, while the upper surface is strongly convex. In length the beetle is one-fourth of an inch and in breadth three-sixteenths of an inch at the widest part. The body varies in colour from light to dark yellowish-brown and is spotted with black. The head is somewhat retracted into the prothorax and bears a pair of black eyes. The antennae are yellow with brown clubs, while the mandibles and palps are also tipped with brown. The ventral surface is light to dark brown in colour and the legs are yellow with brown tarsal claws. The prothorax bears from 2 to 7 black spots. These spots vary in size as well as arrangement, and adjacent spots frequently coalesce. The spots on the wing-covers are variable in both number and size. Gurney¹ states that there may be from 24 to 28 spots on the elytra. Mulsant has given specific names to some of these variable forms of *E. 28-punctata*, one of which was described by Tryon³ in 1889 as having 26 spots on the elytra and which he refers to as *E. multipunctata* Muls.. The beetles examined were uniformly 26 spotted, each elytron bearing 13 black spots, the spots exhibiting variation in size in different specimens. From Tryon's description it is believed that the insect referred to is identical with the one studied in this laboratory.

The body is covered with a very fine pubescence. The female is slightly larger than the male, being distinguished from the latter by a median slit on the ventral surface of the last abdominal segment.

Habits of Adult.

The adults only fly short distances; when disturbed they fall off the plant and feign death, drawing the legs in flat against the abdomen. When handled they secrete a bright yellow fluid from the knee joints which is acrid smelling and is probably used as a defence against enemies.

In the laboratory and field, pairs were observed mating daily. Two females were confined in tubes with males and they commenced laying some sixteen to eighteen days after emergence, one laying 125 eggs, the other 252 eggs. Under natural conditions it is believed that the total number of eggs laid by a single female would exceed those laid under artificial conditions. The oviposition records are given in Table II.

Natural Control Factors.

A small brown ant, *Pheidole megacephala* Fab., is under suspicion as being an active agent in keeping the ladybird in check. It was found swarming over the host plants of *Epilachna* on which numbers of newly-laid egg clusters, distinguished by their bright-yellow colour, were observed on the leaves, but comparatively few egg clusters from which larvæ were emerging were found, indicating the destruction of large numbers of eggs.

Two hymenopterous parasites, which were identified as *Stomatoceras colliscutellum* Gir. (Plate 1, Fig. 6), were bred by Mr. I. W. Helmsing from pupæ collected on 12th November, 1927, at Maryborough.

Artificial Control.

Immediate action should be taken to check the increase of the pest as soon as the first signs of attack are noted. This insect has biting mouth parts, so a stomach poison must be used which can be spread in a thin layer over the surface on which the larvæ and adults are feeding and so be taken into the stomach.

Lead arsenate is found to be the most satisfactory poison and is procurable in both paste and powder form. When mixed with water it is applied to the plant in the form of a spray, care being taken to see that the under surface of the leaves are sprayed, for it is there that the larvæ feed.

Where powder is used the following proportions are advisable:— $1\frac{1}{2}$ lb. lead arsenate to 50 gallons of water. Before adding the bulk of the water to the powder it is necessary to mix it into a thin paste, using only a small quantity of the water.

If the paste is used it should be prepared as a spray in the proportions of 3 lb. of lead arsenate to 50 gallons of water.

Cultural Measures.

In cases of severe infestation the crops should be ploughed under so as to destroy thousands of eggs, larvæ, and pupæ. Weeds which serve as food plants should be destroyed even when no crops are planted.

Description of Larval Instars.

1st Instar.—Average length 1.5 mm., breadth .52 mm. Body yellow bearing six longitudinal rows of fairly stiff branched spines, except on the prothorax where there are four and the last two abdominal segments where there are none. The spines are arranged in two dorsal, two latero-dorsal, and two latero-ventral rows. Spines dirty yellow with brown tips, base of spines dirty yellow. Head dirty yellow, ocelli brown, tips of mandibles reddish brown, legs yellow, tarsal claws brown. The abdomen tapers posteriorly, the last few segments being recurved and forming an attachment for the larva.

2nd Instar.—Average length 2.5 mm. Larva similar to previous instar except that spines are more branched.

3rd Instar.—Average length 3.4 mm. Similar to previous instar, spines more branched, faint brown markings partly surrounding base of prothoracic spines.

4th Instar.—Average length 6.8 mm. Body yellow, base of spines and spines dirty yellow, tips of spines dark-brown, spines much more branched than in any of the previous instars. Head dirty yellow, ocelli dark brown, mandibles reddish brown, legs yellow with brown tarsal claws. Rectangular base of spines becomes outlined with brown markings which surround or partially surround it, the thickenings becoming more pronounced as the larva approaches pupation. When fully grown the larva attains a length of 9 to 10 mm., the body becomes paler, the spines stiffen, the base of the spines becoming much darker and thicker.

TABLE I.

Series Number.			Incubation Period.	Period of larval instars in days.				Pupal Period in days.	Total Develop- mental Period.
				I.	II.	III.	IV.		
7	..	..	4 days	4	3	5	7	4	Days. 27
8	..	..		3	4	4	8	4	27
9	..	..		4	3	5	7	4	27
10	..	..		3	3	5	8	4	27
11	..	..		4	4	4	7	4	27
12	..	..		3	4	4	7	4	26
13	..	..		3	3	6	8	4	28
14	..	..		5	5	4	7	4	29
15	..	..		4	7	5	7	4	31
17	..	..		4	4	4	7	4	27
20	..	..		6	3	3	6	4	26
21	..	..		4	3	4	6	4	25
22	..	..		4	3	4	7	4	26
Average ..			4	3.92	3.79	4.37	7.07	4	27.15

Period over which developmental studies were made extended from 29th December, 1927, to 3rd February, 1928. Average minimum temperature, 76 deg. Fahr.; average maximum temperature, 81 deg. Fahr.

TABLE II.

Series Number.	Date of Emergence of Beetle.	Date of Oviposition.	Number of Eggs Laid.	Period elapsing between emergence of beetle and oviposition.	Total Number of Eggs.
I. 	27-12-27	14-1-28	23	} 18 days ..	252
		15-1-28	19		
		19-1-28	10		
		22-1-28	17		
		23-1-28	19		
		24-1-28	23		
		26-1-28	25		
		28-1-28	27		
		31-1-28	32		
		3-2-28	20		
		11-2-28	19		
		14-2-28	18		
II. 	9-1-28	25-1-28	9	} 16 days ..	125
		26-1-28	14		
		28-1-28	10		
		29-1-28	27		
		31-1-28	13		
		2-2-28	24		
		3-2-28	28		

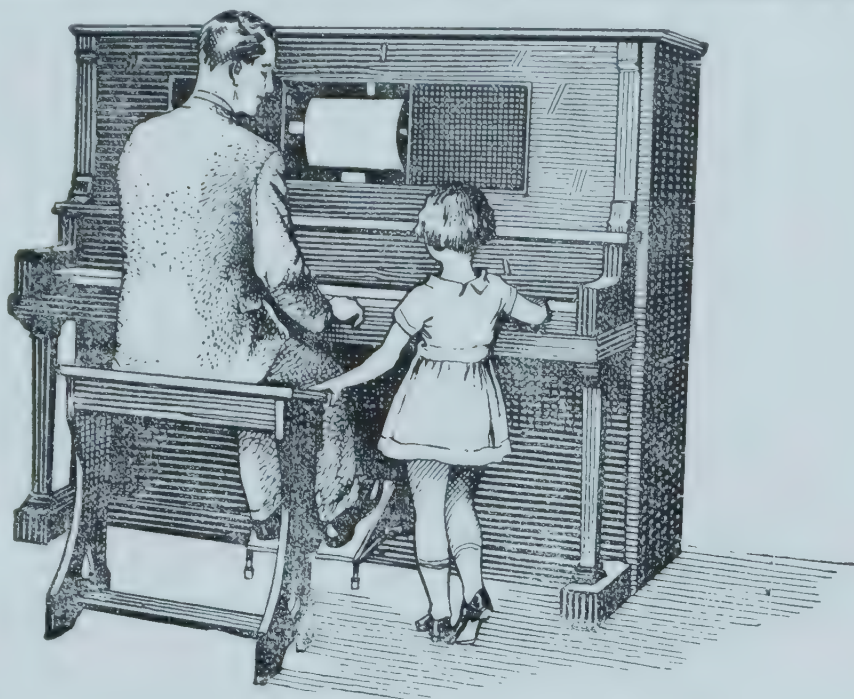
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Photo.: Miss J. Easton.]

PLATE 2.—DOWN THE VALE—A SCENE ON COOCHIN COOCHIN.



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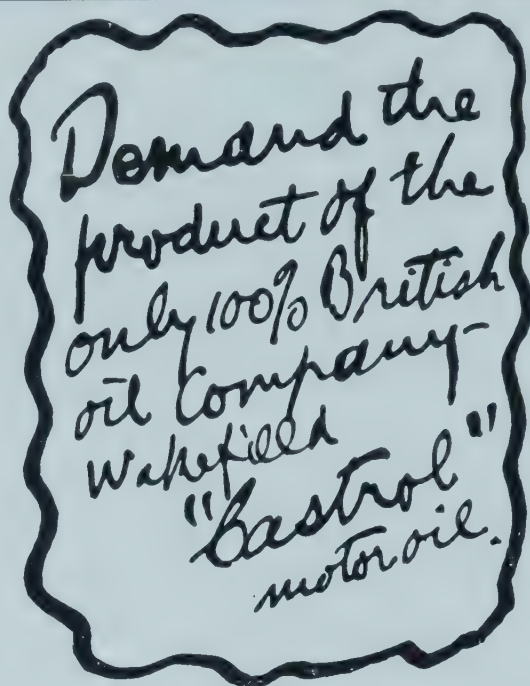


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AUSTRALIAN RURAL PROBLEMS.

BUREAU OF AGRICULTURAL ECONOMICS.

INTERSTATE MINISTERIAL CONFERENCE AT PERTH.

Perth was the venue this year for the Annual Interstate Conference of Ministers for Agriculture. Every State was represented, and the Western Australian Minister (Hon. H. Millington) presided. One of the most important subjects discussed was a Queensland proposal to establish a Commonwealth Bureau of Agricultural Economics. Subjoined are extracts from the report of the proceedings, which will be read with interest by Queensland farmers.

The Conference opened on Tuesday, 5th June, and continued until the following Thursday. The delegates to the Conference were:—

New South Wales.—Hon. H. V. C. Thorby, M.L.A. (Minister for Agriculture), Messrs. G. D. Ross (Under Secretary, Department of Agriculture), T. MacInnes (Dairy Expert), C. G. Savage (Horticultural Superintendent), and H. Luckman (Secretary).

Victoria.—Hon. J. Cain, M.L.A. (Minister for Agriculture), Dr. S. S. Cameron (Director of Agriculture), Messrs. R. Crowe (Export Superintendent), J. Thynne (Secretary to the Minister), and J. M. Ward (Director of Horticulture).

South Australia.—Hon. J. Cowan, M.L.A. (Minister for Agriculture), Professor Perkins (Director of Agriculture), and W. L. Summers (Secretary to the Minister).

Queensland.—Hon. W. Forgan Smith, M.L.A. (Minister for Agriculture), Mr. E. Graham (Under Secretary for Agriculture), Messrs. T. G. Hope (Secretary), and C. McGrath (Supervisor of Dairying).

Tasmania.—Mr. F. E. Ward (Director of Agriculture), Messrs. T. H. Atkinson (Senior Dairy Officer), and P. H. Thomas (Horticultural Officer).

Western Australia.—Hon. H. Millington, M.L.A. (Minister for Agriculture).

Mr. Millington was elected as Chairman.

OPENING ADDRESS.

The Chairman, in the course of his opening address, said that the Annual Conference of State Ministers was not merely a gathering for the exchange of formal courtesies, it was an assembly of major importance to all engaged, either actively or as administrators, in the general welfare and development of the great primary industries of Australia. They were not all satisfied with the progress being made, and no one realised more than Ministers and their officers the enormous amount of work ahead of them and the necessity for a periodical exchange of views through which a general policy in respect to interstate interests might be determined. They had also to consider their relationship with the Federal Government in respect to matters of mutual concern.

The Chairman went on to review the remarkable development of his own State from the gold mining days to the present period of vibrant agricultural prosperity. He then declared the Conference open for business.

CONFERENCE PROCEEDINGS.

A summary of action taken in respect to the decision at the Adelaide Conference in 1927 was discussed in detail.

Admission of the Press.

The question as to whether the Press should be present during the proceedings was raised.

Mr. FORGAN SMITH (*Queensland*) moved that the Press be admitted. They had everything to gain, he said, by the admission of the Press, and information on the matters they had met to discuss could not be disseminated too widely. The motion was carried.

The agenda was dissected, and several subcommittees were appointed to consider and report on the subjects submitted.

Bureau of Agricultural Economics.

Mr. FORGAN SMITH (*Queensland*) moved that the Conference give very serious consideration to the most important question of the establishment of a Bureau of Agricultural Economics. The text of his able address is published elsewhere in this issue.

Mr. H. V. C. THORBY (*New South Wales*) seconded the motion. The general principles enunciated by Mr. Forgan Smith, he said, were sound. The general trend of his remarks was that each State should establish its own Bureau and look to the Federal Authorities for Commonwealth co-ordination. He gave the proposal his whole-hearted support, but he was emphatic that the work should be carried out in detail by the respective States, leaving to the Commonwealth the co-ordination of results.

Messrs. J. COWAN (*South Australia*), J. CAIN (*Victoria*), and F. E. WARD (*Tasmania*) supported the motion.

After inviting further discussion on the principle involved, the CHAIRMAN stressed the need of the States carrying out their own investigational work. He was in accord with the motion provided means for complete co-operation were devised. The scheme outlined by Mr. Forgan Smith was, he said, undoubtedly an Australian one, and they must have machinery to work it in a way big enough for an Australian policy. He congratulated Mr. Forgan Smith, and added that the Conference was in accord with him.

The complete resolution, which was adopted, was submitted in the following terms:—

1. That it be a recommendation from this Conference that each State Department of Agriculture should establish an Economics Branch or Division.

2. That the State Parliaments provide such legislation (or amending legislation) as may be necessary to establish and facilitate the work of the Economic Divisions.

3. That the Commonwealth Government be asked to co-operate with the States in this matter by constituting an Agricultural Economics Committee under the Council of Scientific and Industrial Research. Each State Government, together with the Commonwealth Government, to nominate a representative to sit on such Agricultural Economics Committee.

Dingo Depredations.

The adoption by the State and Federal Governments of uniform methods for the protection of the live stock of the Commonwealth from the depredations of the dingo was affirmed on the motion of Mr. E. GRAHAM (*Queensland*).

Restriction on the Importation of Stud Sheep.

The restriction on the importation of studsheep into Australia by fee and by insisting on the provision of the certificate of a recognised breeders' society was approved on the motion of the CHAIRMAN.

Uniform Grades and Standards.

On a question raised by Mr. FORGAN SMITH (*Queensland*) as to the desirability of grading produce on uniform standards, Mr. THORBY (*New South Wales*) moved—

“That Conference is strongly of opinion that it is undesirable to lower established standards of export products to meet temporary or seasonal conditions, and that the Commonwealth Government be informed accordingly.”

The motion was carried.

Fertiliser Control.

The question as to the need of uniform legislation in respect to the control of the sale of fertilisers was affirmed.

Salt Licks for Stock.

The Conference affirmed the principle of compulsory registration and guarantee of salt licks for stock.

Buffalo Fly.

Mr. FORGAN SMITH (*Queensland*) moved—

“That Conference is of opinion that measures should be taken by the Commonwealth and States concerned for the control and eradication of the buffalo fly.”

The motion was carried.

Educational Publications.

Mr. FORGAN SMITH (*Queensland*) moved—

“That the Commonwealth Government be requested to convey within the Commonwealth free of postal charges publications of an educational nature circulated by State Departments of Agriculture.”

The motion was carried unanimously.

Much other important business was transacted at the Conference, and which must give additional impetus to the agricultural progression under able guidance now to be observed in every State in Australia. Queensland has adopted not only a progressive but an aggressive rural policy, and a recognition of this fact by the representatives of the other States is evident from a study of the lengthy record of the Conference proceedings.

After receiving the reports of the several subcommittees and adopting, in general, their recommendations, the Conference selected Melbourne as the venue for the 1929 assembly.

A Tribute to the Australian Press.

Before closing the proceedings, the Chairman (Mr. H. MILLINGTON, *Western Australia*) paid a graceful tribute to the daily Press of Australia. “I should like to express,” he said, “our appreciation to the Press for the manner in which the Conference proceedings were reported. They have not tried to pick out merely the titbits or something sensational. I believe the Press in Australia realises it is part and parcel of their duty to assist in agricultural development, and we depend upon them for disseminating such information as should be available to the people throughout Australia.”

The Conference then closed.

THE JOURNAL APPRECIATED.

A Sarina farmer writes—

“The amount of information is splendid, in fact every subject is treated in the most scientific manner possible.”

BUREAU OF AGRICULTURAL ECONOMICS.**THE MINISTER'S SPEECH AT THE PERTH CONFERENCE.**

"In Australia we have laid down certain definite standards of living, and it is desirable that those standards should be maintained and made secure."

"Any system of social organisation must have as its starting point a sound agricultural policy."

"Men who are prepared to go on the land and encounter the vicissitudes of country life, granted that they are industrious, must have the right to a decent standard of comfort as high at least as the community can afford."—*Hon. W. Forgan Smith, at Perth.*

ONE of the most notable utterances on current rural problems delivered at the Interstate Conference of Ministers for Agriculture at Perth last month was the speech by Mr. W. Forgan Smith, of Queensland, on the question of setting up a Bureau of Agricultural Economics in each of the States with a fully representative Economic Committee of the Council of Scientific and Industrial Research as a co-operative and co-ordinating authority.

Subjoined is the text (abridged) of the address taken from the official report of the Conference proceedings.

THE MINISTER'S ADDRESS.

HON. W. FORGAN SMITH: I move that the Conference give very serious consideration to this most important question. Everyone must realise the importance of investigation into the agricultural economics of Australia. The problem becomes increasingly pressing as modern development in industry takes place. In Australia we have laid down certain definite standards of living, and it is desirable that those standards should be maintained and made secure on a sound basis as the years go by.

This is of extreme importance in regard to the primary producing industry. Any method of social organisation in the country must have as its starting point a sound agricultural policy. In order that this may be done, measures must be taken to ensure that those engaged in the production of the essentials of life shall be made as comfortable as possible and their conditions attractive. In other words, men who are prepared to go on the land and encounter the vicissitudes of that form of industry, granted they are industrious, must have the right to a decent standard of comfort of as high a character as the community can afford. The problem is as to how it is best to develop the country, and the resources of the country, in the interests of the people who are living in it.

Economic Waste.

Our methods of production indicate that there is much waste going on. No concerted effort is made to produce for the new needs of the country or the new needs of the markets we are endeavouring to supply. There is no co-ordination in the various activities in which we are engaged. Each of the States seeks to develop its industries in its own way, and often no information is available from the results of the activities in which they are engaged. Take, for instance, the development of the various forms of settlement immediately following upon the war. In connection with the soldiers' settlements schemes, all the States induced men to go on the land without having investigated the fields of production or the marketing of the product. All the States have experienced great loss in that way, but that is not the worst phase of it from the point of view of the State. There is the loss of energy and the discouragement that is brought about by the partial failure of settlers who have been placed on the land, without being able to establish themselves fairly and effectively.

Arresting Figures.

In addition, we find on a review of the Commonwealth statistics that we are importing very many products into Australia that could easily be produced here. Every effort should be made to make ourselves as self-supporting as possible, and a

review of the figures taken from the Quarterly Summary of Australian Statistics, December, 1927, indicate some of the things to which it is worth while giving attention. There is one very arresting table. We find that for the first six months of 1927-1928 foodstuffs of animal origin, excluding living animals, valued at £1,554,600, were introduced into the Commonwealth, and foodstuffs of vegetable origin, &c., valued at £3,457,988. That means that approximately £5,000,000 worth of produce was introduced into Australia in six months, a great proportion of which could have been produced in Australia.

Among those items are cocoa and chocolate, coffee and chicory, fruits, dried, including dates, nuts (edible), seeds (canary, hemp, and rape), and tea. These go to make up the commodities imported and that could be produced in Australia.

The Need of Effective National Organisation.

It is my desire to focus the attention of Ministers to the need of some organisation whose duty it would be to deal with all these matters and bring them to the attention of the proper authorities concerned. The Bureau of Scientific and Industrial Research has had under consideration the establishment of an Economics Department along the lines I am suggesting, and if we carry a resolution of this kind here to-day no doubt it will have a very beneficial effect. Such an institution would have a wide range of work in front of it.

Such an organisation is not new. In Great Britain an organisation of a similar character is in existence, and has done very valuable work. The same thing applies to the United States. It seems to me that the time is opportune for an organisation of this kind to be established in Australia, to carry out the work that has been undertaken so successfully in Great Britain and America by similar institutions there.

I have mentioned the fact of the States embarking on schemes of settlement and inducing settlers to take up land suitable to the growth of certain crops without investigation as to the demand for the products to be grown, or their marketing when produced. That indicates something lacking. It would be the function of such a bureau to deal with these matters, to co-ordinate the experience that has been gained in the several States and circulate the information.

Making Agriculture Attractive.

In addition, we have the problem of establishing agriculturists in a manner conducive to making their calling attractive. I believe that agricultural pursuits are the natural avocation of men. It is more conducive to the building up of a sturdy nation or race of people than any other occupation. Anyone can understand that men working under healthy conditions will produce a healthier type than those who are working in an environment less congenial.

The Costs of Production.

At present in Australia farming organisations are continuing to press Governments and endeavouring to educate public opinion as to their rights to secure what they call the costs of production. We receive deputations from these organisations where that question arises, but I have never yet been able to get them pinned down to what they mean by the costs of production, or as to how these costs of production are going to be assessed.

In the course of his opening remarks the Chairman referred to the dairying industry, and said that in Western Australia the average return per dairy cow probably does not exceed 100 lb., whereas the purebred herd of Guernseys at Denmark (Western Australia) are producing 450 lb. Yet you find men engaged in the dairying industry having herds of low production arguing in favour of increased concessions to enable them to enjoy a better standard of living. It is very apparent to anyone interested in the dairying industry that the line of activity should be in the direction of building up the herds as an economic unit in such a way as to secure the maximum return per unit in the herd.

Milk Yields Far Too Low.

In Australia generally the figures for the several States on investigation must show that the yield of commercial butter per dairy cow is far too low. In Queensland the average is 120 lb., and good herds produce considerably more than that. That indicates a line of activity that could be successfully followed to stabilise that

industry and give those engaged in it better returns. It is obvious we must devote our attention to the production of the class of herd that will keep the farmer rather than to the class that the farmer himself has to keep.

The Economic Unit in Dairying.

Then again, having disposed of the first problem, we have to consider what is the economic unit of the herd. By what means can we determine how many in a herd constitutes an economic unit—that is, the unit that a dairyman can look after economically? That is the line of investigation that must be taken up and has been taken up very successfully by the Bureaux to which I have alluded.

The Poultry Industry.

Take, for instance, the poultry industry. The production of eggs and poultry is the fifth most valuable in the United States of America, and the wealth is higher than the yield in many other products which would be considered among the highest produced there. They lay down that the economic flock of fowls is 1,000.

What is a Living Area?

Then we come to land settlement from the economic standpoint. We often use the term "The living area." We understand what is meant by that term, but in an economic sense it is obviously misleading. The living area varies according to climatic conditions, according to the condition of the soil, and for what it is proposed to utilise the land and the markets.

Hon. J. Cain: And very often to a large extent it is also the individual.

Hon. FORGAN SMITH: Yes. That shows the lines we should follow to establish not so much, perhaps, the living area but to establish the living herd, the living flock, and the living volume of produce. We have endeavoured to do that by a very exhaustive investigation into the pastoral industry. Apart from the immediate question of land settlement, this was one of the most valuable economic investigations into the pastoral industry that has been made for the last twenty years. Following on that report we have legislated to provide that in all future land settlement a sufficiency of land will be provided to maintain what is regarded as the economic unit of a flock or herd, or the volume of produce that it will be necessary to give a man a decent standard of living on the variations that take place from time to time.

It will be seen that an economic investigation of these matters I have mentioned would be conducive to greater clarity of thought, and much information would be made available to the various State Departments which would be of incalculable advantage in building up our primary industries.

Market Control.

Then again, there is the question of market control or organisations to prevent fluctuations of prices. These are established in almost every form of industrial activity outside of primary production. Very careful analyses are made as to the consuming capacity of a given commodity. An organisation producing carpenters' saws, for instance, can foretell with a fair degree of accuracy the number required in any one year by the world's markets. The same remark applies to motor-cars, machinery, and so on. It would be the duty of this organisation to investigate marketing conditions, the maximum consumption that is likely to take place, and organise the industry accordingly. In regard to our primary production little or nothing has been done in this direction. The farmer is about the only individual that produces without any foreknowledge of the marketing conditions attaching to his product. As a result you have violent fluctuations in prices in the various markets of the world, both in Australia and elsewhere. During the season when Nature is most bounteous you find a glut in the market, and the farmer gets little or nothing in return for his labour. Under other conditions the market is under-supplied, prices are high, and in many cases only a few people can supply that market. As a consequence the result is bad from the farmers' point of view and from the point of view of the consumer. You have a number of products from which a man can choose, and with orderly marketing you can build up a steady demand for that product, but that demand depends very largely on continuity of supplies. If there is a surplus at one period, and you are unable to supply at another period, the whole market is disorganised; there is no control of prices, and it is detrimental to the interests of all concerned.

Functions of the Bureau.

The work of an economic bureau would be in the direction of giving assistance in the building-up of marketing organisations which would be conducive to the best interests of all concerned. I suggest that the function of such a bureau would have regard to the following matters:—

Climatic influences; land values; systems of farming practice, mixed farming in contradistinction to single commodity operations; costing of commodity production; finance for production; handling, grading, and packing methods and facilities; transportation; storage; processing; marketing credit; local markets as distinguished from world's markets; the influence of fiscal policies; the relation of the production of a given State to the world's production; problems dealing with the treatment of surpluses, the varying tastes and preferences of consumers; the relative influences of one commodity upon that of another; marketing conditions generally.

It is not my intention to speak at any greater length at this juncture on this matter, but I think I have said enough to indicate what is in my mind and what has caused me to move the resolution now before you.* Work along the lines I have indicated would tend towards the elimination of waste and towards building up a higher standard of production. Nothing could be more important than that. **High standards of living can only be maintained on the basis of high efficiency in industry, and these are points that can only be established by an investigation along the lines I have indicated. It would help in the building-up of the primary industries of Australia and increase the general wealth and happiness of the people of the Commonwealth.**

*The full text of Mr. Forgan Smith's motion appears in our abbreviated report of the Conference proceedings in this issue.—ED.



PLATE 3.—SOME MEMBERS OF THE FIELD STAFF OF THE FRUIT BRANCH,
DEPARTMENT OF AGRICULTURE AND STOCK.

Left to Right—G. Williams (Director of Fruit Culture), J. Stockdale (Brisbane), H. Barnes (South Coast), E. Duffy (North Coast), A. M. Thorburn (Brisbane), H. J. Freeman (Gympie), F. L. Jardine (Nambour), E. Filer (Entomological Branch), S. C. Stephens (Innisfail)



Photo.: G. H. Parsons.]

PLATE 4.—BRITISH BREEDS OF LIVE STOCK—SHIRE MARE.

A representation of the type aimed at by British breeders (reproduced from "Farming," an English publication).



Photo.: "Sport and General."

PLATE 5.—BRITISH BREEDS OF LIVE STOCK—GUERNSEY COW.

A representation of the type aimed at by British breeders (reproduced from "Farming," an English publication).

PINEAPPLE DISEASE INVESTIGATIONS.

INTERIM REPORT.

By HENRY TRYON, Plant Pathologist.

A. INTRODUCTORY.

1. The inquiry in progress serves to support the opinion that pineapples as grown in the open in Queensland are subject to several distinct "troubles," some of which have proved notably harmful and are still so, yet they are, notwithstanding, as vigorous and healthy on the whole as are pineapple plants grown as a field crop in other parts of the world.

2. However, yields of commercial pineapples vary within wide limits, but, as a rule, the differences to be observed are due more especially, not to disease occurrence, but to recognisable factors relating to circumstances and conditions of growth.

3. And among these are certainly controllable ones, constituted by horticultural methods adopted, and that vary in different plantations in every district, with respect, too, to almost all procedures.

4. Economic considerations—as, for example, where the use of pineapple soil fertilisers or drainage is in question—may be the explanation and justification of this variation.

5. More frequently it is want of knowledge regarding the better course to pursue, either arising through absence of authoritative teaching or of the lessons derived from experience.

6. In the subjoined summary of investigations of pathogenic agents that do, however, prove prejudicial to successful pineapple growing, a consideration of the extent to which these may operate in the several districts of the State where this occurs has been for the present postponed.

7. This has been due to the fact that visits to plantations in detail throughout the area have not been generally prosecuted, since the necessary adequate thorough personal inspection would have involved much time and labour that would have been incompatible with the often tedious and protracted minute examination of disease-affected pineapple material in the laboratory—so essential to our preliminary pioneer undertaking. Moreover, protracted drought succeeded by much rainfall would have operated to render a disease survey inconclusive in yielding material results, when it might in their absence have been otherwise.

8. To overcome this conflict of duties and reduce the effect of stressing the importance of one, our original scheme contemplated the active co-operation of another Bureau of the Department having several district field officers on its staff in order to discover the local occurrence of pineapple diseases of whatsoever description and their local range.

9. The foregoing explanation why an extended pineapple disease occurrence survey has not so far been undertaken throughout the Cooktown-Tweed River coastal area may be applied also to the lack of field experimentation devised by us, and carried out under our direction, for the purpose of advancing and checking conclusions the outcome of technical research prosecuted; but, too, as a guide in devising procedures at large in both preventing and controlling the pineapple troubles with which this research has been concerned.

10. But in the case of the several pineapple maladies of a non-parasitic nature primarily—physiological pineapple maladies—field experimentation from this point of view is very needful, even, moreover, to throw light on the nature of the circumstances giving rise both to their presence and destructive energy.

11. Most if not all of Queensland's pineapple diseases or virtual diseases are apparently common to the State and other pineapple-growing countries (the conclusion of both testimony and of personal observation). However, in reference to some of them elsewhere—notwithstanding successive investigators for years past have been inquiring into them from their several points of view—unanimity as to their causation has still to be reached, whilst as regards others our own findings (we may be excused in mentioning) have assisted in promoting this; a remark that applies to pineapple wilt on the one hand and to pineapple brown fruit rot on the other.

12. As an incident too frequently realised, bearing both in the wider occurrence and active perniciousness of pineapple maladies in the State, our inquiry (so far undertaken) has served to compel us to dwell upon the fact of the very prevalent

creation of new pineapple disease areas, by (1) the use of already infected stock in planting and by (2) devoting to pineapple cultivation land already tainted with a malady derived from another crop plant, and common to the pineapple. Nematode Root Gall of, say, the banana, &c., and a root disease of sugar-cane may both be mentioned in this latter connection. The interplanting of other economic plants with pineapples may, as we have noted, conduce to the same injurious results.

13. Pineapple diseases and pineapple injurious insects often constitute different aspects of a common trouble, and thus the latter have not escaped our attention.

14. A comprehensive pineapple memoir exclusively devoted to diseases and injurious insects is in process of preparation, but its completion must be deferred until our detail inquiry has been further prosecuted and certain outstanding questions have been settled.

A series of educational addresses in the several pineapple districts of the State are also projected when the progress of our inquiry will admit of it, and when a disease-occurrence survey has revealed those pineapple maladies that are present where such an undertaking is called for and in order to give point to whatever information it is sought to convey.

B.—NOTES ON THE NATURAL ENEMIES AND DISEASES OF PINEAPPLES.

1. AGENCIES—HARMFUL GENERALLY.

1. Top Rot—Root Disease.

This pineapple malady is characterised by the death of the central leaf-shoot of the plant (whence should arise the flower and fruit) in the early course of the trouble, the apical growth undergoing a form of wet decay. This, as we have discovered, is due to an injury of the extreme root ends also following damage in the first place to the absorbent root hairs occurring here. It arises from the development of an irritant in the soil itself, whilst the initial injury mentioned gives rise to and is augmented by a soil-frequenting fungus that, invading the root tissue, gradually also destroys it. Top Rot of the pineapple plant is very destructive where it occurs, but is neither necessarily hereditary in the plant nor necessarily infectious. Our observations have shown that it becomes manifest only in locations in plantations of a special character in which drainage is held back by retentive subsoil or by depressions therein at a low depth from the surface, or if of more profound occurrence connected therewith by a soil (fine sand for example) that admits of its upward movement by capillarity therefrom, whilst the chemical irritant itself is provided by the unaerated soil through which the drainage has percolated. This disease closely resembles that of a sugar-cane disease that we have described under the name of Top Rot also. In the Hawaiian Islands, a pineapple disease, referred to under the term Pineapple Wilt, and as being the most formidable trouble encountered in plantations there, has, in the light of our description of the malady under notice, been regarded by L. D. Larsen as identical with it; but the question involved is one that we are not ourselves prepared to decide. Top Rot, that may be very prevalent in certain places in Queensland but usually occurs quite locally and in circumscribed areas, can, as we have seen, be prevented occurring by cultural procedures, and the avoidance of uncongenial sites in pineapple growing.

2. Base Rot.

In this pineapple trouble, the individual leaves are successively involved from the base of the plant upwards, younger and still younger ones being gradually the scene of the morbid changes that characterise it. The affected leaf, or leaf-portion, firstly develops a *yellowish-green* colour that contrasts with those still unaffected that may exhibit a *vivid-green* colour. Then it dies from the tip towards its base until it is affected in its entirety. At first, the part destroyed becomes grayish-brown and flaccid, the demarcation between it and the still sound portion being marked. Usually, except in quite young plants (suckers), the death of the pineapple is only very slowly realised; but it soon ceases to thrive and remains without evidence of prospective fruit production. The malady is also now responsible for many of the "misses" met with in newly established pineapple plantations, or new areas devoted to the plant therein, and especially in replanted blocks. We have found Base Rot manifesting itself sporadically in plantations usually, although not seldom being responsible for noteworthy damage in the aggregate. Also, that it is due to a special form of decay that commences in the broken tissue occurring at the spot in the sucker that marks where it has been detached from its parent; or starts in the abortive pineapple at the base of a "gill sprout"; and, too, that a very small area involved in decay here may effect trouble.

It has been discovered that this Base Rot may be prevented by exposing suckers intended for use as plants for some days so as to admit of their ends drying out; and in the case of gill sprouts by first detaching the swollen basal portions or miniature pines from which they arise before doing this. Dipping, too, the broken or cut ends in a fungicide, will afford also a further safeguard. Again, planting in soil still saturated with moisture conduces to Base Rot, and should be avoided. Further, during moist muggy weather this trouble may develop in suckers that are left in heaps, or are being trucked, in both cases whilst in a damp sappy condition, and that in such circumstances the Base Rot may become manifest within a week or two of planting them.

The inquiries have suggested that our pineapple Base Rot is identical with the pineapple Blight of Florida.

3. Chlorosis ; or Leaf Pallor.

This, again, is a constitutional trouble that, as we have discovered, is in some situations fraught with serious damage to the plantations. In this there is until lately, and unlike what occurs in "Top Rot" and "Base Rot," no decay of the stock internally taking place. The entire plant presents a sickly appearance, being of a general palish hue of colour. The first leaves to be affected are the outer—the older ones. Thus, whilst the inner leaves of the central shoot may be merely clouded with creamy yellow, the outer ones external to it may be almost white instead of green, with the central broad purple band changed to red and often almost lost. These changes, however, may occur in pineapple plants that previously have shown normal growth, but with their manifestations this is brought to a standstill. Following these symptoms of sickness, a wet form of decay may set in, involving the older leaves—now horizontal on the ground—where they are attached to the stem, the stem itself in this situation, if not earlier, and so in turn the roots. This decayed tissue supports a white filmy growth of fungus. The trouble, however, is not due to the attacks of any such organism acting as a parasite. On the other hand it is an indication of the effect on the plant of soil that has become saturated with surface drainage, and which may persist when this soil only holds sufficient moisture to ball when compressed in one's hand.

The lay of the land, with regard to a plantation or any part of it, will indicate where this pineapple chlorosis is likely to take place, and where the preventive measure of proper drainage should be undertaken.

All authorities on pineapple growing emphasise the necessity of "proper provision for suitable drainage," and disregard of this requirement has even been mentioned as one of the causes responsible for continuously diminishing yields in fruit production.

4. Root Tangle.

This, although not a disease proper, has been observed to considerably affect returns from all crops, subsequent to the plant crop, and even so its prejudicial effects have been noticeable, especially in the late dry season. It arises through the inability of the roots that start from the root granules, occurring on the plant at the base of each sucker, and beneath the leaf-sheaths here, to reach the soil, owing to these leaf sheaths failing to decay and break down, and so admit of their emission, whereupon they become confined to the narrow spaces between leaf bases and stem, and so as they grow pursue an irregular winding course often side by side but with more or less interlocking.

This condition is commonly realised when suckers have not had their basal leaves removed in sufficient numbers prior to planting, or when they have been planted in the flat, so that when rain falls the surface soil surrounding these suckers is too dry to admit of the leaf-sheaths naturally decaying under the influence of saprophytic organisms, as they continuously do when it is moist. It is to be observed also that the use of butts, in so much as they result in the suckers arising from them, being higher (set) in the ground than if independently planted, is again very conducive to root tangle. In crops again beyond the plant crop, the suckers that yield this are succeeded by others that spring laterally from the stem as it branches growth in fruit production. Thus successive suckers start higher and higher from the ground, and thus even the first produced is often unable to send roots to the earth by decay of its lower leaf, unless special means are taken to ensure this. This tangle in fact militates against the functioning of any roots except those originally entering the soil shortly after planting.

This circumstance may be overcome by forcing the branches of the plant towards the ground, or bringing the earth upwards towards them, as by turning the land towards the plants in ploughing rather than away.

5. Wilt.

Two apparently distinct pineapple affections have been brought under notice with the title "Pineapple Wilt" assigned to them. Both may be exhibited by younger or older plants.

(a) In one the pineapple plant (sucker) after growing perfectly erect for a time gradually curves over, the older leaves being directed in this movement more or less regularly to the side to which this takes place. This foliage presents also an unusual vivid green, except outwardly where it may be more or less clouded with yellow. Each leaf, again, is shortened coming more suddenly to a point and has its margin curving upwards and inwards (involute), so that it appears widened at its base; it is, moreover, unusually turgid and brittle. The entire plant, moreover, has a stunted habit and commonly yields no fruit. Nematode Galls or Mealy Bugs have been found on the roots of affected plants, but the general symptoms evinced are not characteristic of their presence; in fact, both may be absent. Such plants may occur sporadically in good more or less level land.

(b) In this form the stem also gradually inclines over until eventually it may be almost parallel with the soil surface. There is, too, a general pallor of the foliage, and both it and the stem lose their turgidity. Meanwhile the individual leaves become light-coloured, sometimes indeed of a cream-like hue. Then first the lower leaves and then the stem where they originate will both rot and decay. (This may in part be due to sun scald experienced by the plant when horizontally inclined.) This form of "wilt" also affects pineapple plants varying in age, and usually when occurring neither fruit nor flower is produced. In those plants having "wilt" examined, the roots were intact and apparently healthy. This latter form of the trouble usually is met with in poorer soil than the former, and may locally occasion much injury and loss to a plantation.

At present we are unable to state definitely with respect to either form what agency may occasion it, but, although in some respects it corresponds to the pineapple "wilt" of the Hawaiian Islands, that during 1910-19 had no less than five distinct causes assigned to it by as many investigators, it is evidently distinct.

6. Club Root or Root Rot—*Heterodera radicola* (Nematodes).

This, in brief, causes first swellings and then decay of the root-ends, the nutritive absorptive portion, and so gradually determining arrested growth, then virtual starvation of the plant. A most serious pineapple malady is Root Knot, yet one whose nature and cause are both usually overlooked. This we have discovered is widely prevalent, extending gradually its range of occurrence, doing much damage, and, as far as is at present known, almost impracticable to deal with here from the point of view of farm economies in ordinary plantation routine. Its injuries to the plant being usually of an indirect nature, it is commonly spoken of under one term or another that is descriptive of some plant malady distinct from it. It has been found that it is being introduced on to "clean land" through the use of pineapple plant stock, "butts" especially, that are already nematode infected; and thus also with other plants harbouring the disease—tomato seedlings especially grown as inter-crops. But pineapples are commonly infected through growing them in succession on land on which other plant crops have manifested the trouble—e.g., bananas, sugar-cane, potatoes, &c. This is due to the commonly unrecognised fact that the parasite of Root Knot—the nematode worm, *Heterodera radicola*—leaves its temporary host-plant habitually to pass into the soil and thence enters into the roots of other plants susceptible to its attacks. The coping with this form of Root Knot is one of the problems of horticulture and agriculture generally throughout the world, and is being assailed here and elsewhere only by an empirical method of attack; better procedures have yet to be discovered than the costly ones already in vogue.

7. White Soil—Fungus.

The pineapple plant, under the influence apparently of this organism, ceases to thrive, and presents a starved appearance (as does a plant when, say, hanging for some time on a fence) being now of a sickly yellow instead of a vivid green colour. Small patches of plants or individual ones in a plantation may be noticed thus affected. This plant, again, when removed from the ground exhibits

a more or less conspicuous development of white fungus mycelium beneath and between the leaf sheaths covering the base of the stem, and in later stages a rotten condition of the corm develops, the affected tissue eventually becoming dry and powdery. Again, the roots may have white threads coursing over their surfaces; but in some instances the latter (now very slender indeed) may be observed throughout the soil in which the dead or dying roots occur and to a slight extent adherent also to the latter.

This trouble is still under observation, and the final or reproductive form of the fungus apparently implicated has yet to be discovered. Apparently, two different fungi may produce the effects noticed. It reminds one of a well-known sugar-cane disease, in which a small agaric (a species of *Armillaria*) is concerned.

Its presence is evidently favoured by the use of "butts" in planting, rather than suckers, nibs, or crowns, those portions of the stem supporting a growth of fungus is very similar to that associated with the sick plants. Further investigation is projected.

8. Soil.

Abundance of evidence is forthcoming to indicate that pineapple plants or even entire pineapple plantations in Southern Queensland are in some cases being prejudicially affected, from the point of view of fruit production especially, by defects in the soil constituency commonly but not always to be overcome by the addition to it of manurial agents suggested by the plant's chemical composition. The pineapple, as has been shown by others, makes special demands not yet perfectly ascertained in the way of essential nutrients for crop production—ones not always met by even apparently "good ground," or by the addition of what "poor land" obviously lacks to make it so.

In many places the soils devoted to pineapple plants—as is suggested by the appearance of the latter—would doubtless be benefited by incorporation of vegetable matter to supply the necessary humus; but at the same time, their roots being intolerant of acidity in the soil, this would have to be supplied in a manner to avoid the presence of an excess of acid that vegetable matter might yield.

Already the lower soils of one area have been found to be slightly acid, and appearances of pineapple plants grown therein suggest that in some few instances this fact is reflected in the state of health of the plants.

Although the physiological trouble named "Chlorosis" has been commonly remarked, this is not the form of it manifested by pineapples elsewhere, due on the one hand to excess of manganese (Oahu) and the other to the presence of lime in undue amount (W. Indies).

9. Bottle Neck.

The name Bottle Neck is that of a pineapple fruit malformation suggested by the shape assuming the form of a bottle, being narrowed suddenly towards the apex or top that remains small and neck-like and widens basally to represent the body. Usually, too, if the fruit reaches maturity it is of relative small size. Growers associate "Bottle Neck" also with special features, evinced by the prospective fruit, even prior to flowering having taken place—a persistently diminutive flowering head (pine) with scarcely any top, and it of somewhat scale-like bracts, and surrounding this the leaves ill-developed and with their margins turned in on the upper surface (involute), and therefore appearing though narrowed, noticeably so. And, further combined with this, an undue amount of yellow spotting and mottling of the older or lower foliage.

Subjected to these unusual conditions, that may be quite prevalent on certain plantations, the yield in fruit to which this applies may be greatly reduced, and insomuch also as growth may be brought to a standstill or nearly so, it is often that affected pineapple plants have to be eradicated.

The latter constitutional symptoms are not uncommonly met with in pineapple plants whose roots are rendered functionless and partly destroyed by either gall-forming nematodes or by Mealy Bugs, also plants growing in land where Bottle Neck in the fruit occurs; so also, with respect to land that is prone to dry out whenever a drought is being experienced. Still there appears to be another causal agency that may determine in some unascertained quality of the soil, apart from that which may conduce to desiccation in dry times, also acting through the root system. (The local distribution of occurrence of Bottle Neck suggests this.)



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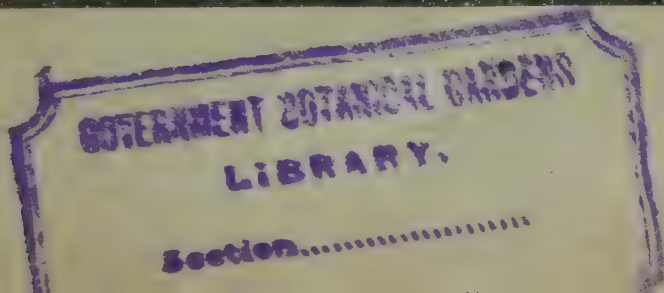
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This, and the association of other diseases with pineapple plants that are alleged to be subjects of Bottle Neck of the fruit, is in harmony with the fact that this malformation is evidently the expression of some factor operating continuously for a period, at a particular time during the development of the fruit, so as to check and even restrain its growth. This critical time is when its apical development—the last to take place in the fruit—is being undergone, so also, when parts other than fruit participate at other times in the pineapple plant's history of growth.

[The occurrence and prejudicial effect of Nematode worms as well as of Mealy Bugs is one for separate consideration.]

The question of the influence of the soil—the occurrence of a special soil type—from a physical and chemical standpoint, needs the co-operation of the chemist and the controlling influence of field experiment.

As may be inferred from the foregoing findings, Bottle Neck—as is evident from facts brought to light—is not a permanent endowment of the pineapple plant. However, it is injudicious to utilise stock from affected areas for planting unless the certainty that it harbours neither Mealy Bug or Nematode Gall is assured.

II.—AGENCIES INJURING THE FRUIT.

1. Fruitlet Core Rot (Tryon), Brown Rot (Larsen), Black Spot, &c.

The fruit disease known under the above names is, as we have found, very prevalent in South Queensland, during the winter season affecting the “winter crop.” It is said, indeed, when pronounced then to involve locally at least 25 per cent. of the fruit, both smooth and rough leaf pineapple varieties being alike subject to it.

It has been termed “Fruitlet Core Rot” by us its discoverer, since it is at first confined to single “pits” of the fruit, and the dark spots just within the outer surface, so evident on cutting the pine across, and so symptomatic of its presence have originated its more popular local name, “Brown Rot,” above mentioned, in the Hawaiian Islands where also it is met with, so also we have the term “Black Spot,” although the tissue first involved is dark-brown rather than this colour. From single pits it may extend to others, especially when the more succulent fruits of the smooth-leaf pine, for example, are attacked. At its commencement it may occur without external symptoms being noticeable. It has been shown by the writer to originate in a very minute injury at the base of the closed calyx cavity or cup (air-chamber of some) and near in it where the pistil is planted. This injury, in the rough-leaf pine at least, is caused by the punctures of a tiny mite of invisible smallness—except when a magnifier is used—an acarid that we have assigned to the genus “Tarsonymus.” At times, however, and more commonly in smooth-leaf pines, the injury consists of a few more or less gaping fissures in the same position as these punctures, caused by the inability of the thin hard tissue here to resist weather changes—from high to low temperature and vice versa—having a disruptive action when as in winter surface extension cannot as here at the same time ensue to withstand it. In each case fungus infection is rendered practicable and takes place at these sites, and is especially operative in causing tissue changes in colouration and decay, through excessive realisation, since the relatively cold winter temperatures in reducing vigour deter the plant in resisting and overcoming the attack of the fungus and the changes that it can effect.

This explanation has been virtually accepted by Larsen as an explanation of Brown Rot in pineapples in the Hawaiian Islands and by Matz as far as relates to Porto Rico (W.I.) with this difference, that whereas the writer regards the fungus implicated as derived from the dead and decayed stamens constantly present within the closed calyx cup, these writers regard the micro-organism as being a *Fusarium* of undetermined species and origin. The fact that this trouble both originates and develops always in a closer space—the calyx-cup in the individual fruitlet or pit—renders direct treatment apparently wholly impracticable. Dusting the flowers with very finely-ground sulphur has not been attended with certain benefit either in the case of the Ripley Queen, or with the common rough-leaf pine. Inquiry is being prosecuted with a view to ascertain to what extent, if any, this fruit disease is virtually hereditary, since the mite mentioned is indigenous to the plant. The circumstance that the trouble is locally prevalent in certain plantations is suggestive, indeed, of locally-grown plants constantly carrying with them the prime agent of this Fruitlet Core Rot.

2. Sun Scald.

The symptoms of sun scald of the pineapple fruit are as follows:—At first one face of it is of a lighter green than is the surface generally and then assumes a pale-yellow hue. A softening and collapse in patches now develops in this area, whilst meanwhile there is slight exudation of sap and later on fissuring—these appearances being suggestive of premature ripening restricted in position and extent to the part in question. These may supervene a change from yellow to dark-brown and following this a drying out shrinkage inwards of the affected tissues—the alteration of colour, significant of decay proceeding deeper and deeper, the conspicuous altered tissue being very noticeable on cutting the pine across. (*Note.*—These progressive changes are detailed since they are usually regarded as symptomatic of a specific disease.)

At first there is no occurrence present of micro-fungi to suggest parasitism as the underlying cause of this trouble, but the presence of morbid moist plant-tissue soon determines the presence of the Brown Rot organism whose destructive activities are promoted by Fermentation Flies (*Drosophila*) that are early attracted by it. Pineapple Fruit Scald with corresponding features is met with also in other countries; and it may be prevented when threatening here as in them by sheltering each individual pine when its attitude acquired during growth suggests it by the use of some light plant debris or cotton, or by raising them under shelter as in Florida, treating the pinery as a whole (a procedure not admissible, possibly, on economic grounds in Queensland, except under special circumstances).

Pines that have been rendered unduly succulent by generous rainfall, or by free use of growth-conducting fertilisers, and thus whilst producing large fruit have not the rigidity so essential for maintaining them in an erect position, are liable to this injury, since leaning over they expose to the sun's rays one face rather than the surface generally. This especially applies to the first or plant crop, but the fruit of succeeding ones are also liable to become oblique since, arising laterally on the plant, the inclination under the circumstances mentioned will be emphasised with age—the bias once produced naturally augmenting.

Fruit affected by sun scald even in a slight degree on being gathered is very liable to travel badly, since the damage once initiated is liable to develop with the ripening process.

3. Cripples.

In this further fruit malformation the symmetry of the fruit is impaired, one side through being invested in growth being flattened or even concave, the pits included in the affected area being relatively small. This in the past especially affected pineapples in the localities longest devoted to pineapple growing (Old Nudgee Gardens), and the pineapple variety earliest cultivated, the so-called "rough leaf"—the smooth-leaf pine (Cayenne) manifesting Fruit Cripple much less frequently. It has been pronounced to be an hereditary trouble transmitted by vegetative growth from affected plants. Also, that it is linked with the presence of a "mesial streak in the leaves." We are not in a position to support either of these conclusions unless on *a priori* grounds. At present the occurrence of these fruit cripples is not a serious matter with regard to pineapple growing, but it is one that may claim attention at our hands in view of this being not so in the future.

4. Fruit Storage Rots.

These are an important consideration since not only do they impair the value of shipments especially overseas, being responsible for a large measure of destruction at times, but they may also affect the value of the pack when ripe fruit is used by canners. Any fruit that is bruised is especially liable to the destructive action of the agents that cause them.

We have not so far been able to prosecute the inquiry necessary for the elucidation of this matter, beyond having discovered that a special species of *Penicillium* (one of the mould-fungi) may be implicated in this work following up the damage arising from mechanical injuries, bruising, &c. It is in this work, that of storage Pineapple Rot, that the organism of "Soft Rot" (*Thielaviopsis paradoxa*) plays such an important part elsewhere.

5. Soft Rot (*Thielaviopsis paradoxa*) (de Seynes), von Hohnel).

The occurrence here of Soft Rot has not definitely been established, but owing to its prevalence in other countries where pineapples are grown as a field crop (e.g., Hawaiian Islands, the West Indies, and Florida) may be expected to already be present in Queensland also. When the fruit disease, originally termed by us "Fraitlet

Core Rot," and subsequently by others Brown Rot, freely affects the smooth-leaf pine it may readily be confounded with it owing to the development of so much dark-brown tissue adjacent to the external surface. It is essentially a disease affecting the ripe fruitlet, generally on its being stored and especially when shipped. In the field should ripe fruit occur, the organism causing it finds entrance through insect punctures or mechanical injuries; in the fruit-store through the cut-end or stem (Base Rot); and on ship board—when the atmosphere is humid—through the general surface (shipping rot). When the fruit is affected, "the tissue takes on a water-soaked appearance, becomes a shade darker yellow than the normal tissue, and has a characteristic odour" (L. D. Larsen)—that of acetic-ether. When exposed to the air, such affected tissue after the lapse of twenty-four hours has become black owing to the formation of innumerable black spores on the surface by the *Thielaviopsis paradoxa* parasite. This may also happen within the core of the fruit when the Soft Rot has proceeded from the base upwards through its centre.

(This Note is inserted for convenient reference.)

6. Watery Core.

Some years since (1918) an anomalous pineapple fruit disease was brought under notice as affecting a locally slowly-growing winter crop on land that had been neglected. The features noticed were as follows:—The core becomes watery and soft; and thereupon this change extends outwards to the surface. The fruits when attacked are partially ripe, but still green on one side. In other respects they are well developed and sound.

This if still now discoverable awaits investigation.

III.—INJURIOUS INSECTS.

1. Root-destroying Beetle Larvæ (*Scarabaeidae*).

These principally prove injurious in pineapple plantations in the southern parts of the State, and especially in special positions (e.g., higher grounds) and special soils ("heavier" ones) within these. The insects are the larvæ of an undescribed species (a large-size one) of *Lepidiota*—a member of the Scarabæid group Melonthidæ, the genus that embraces more than one sugar-cane destroying beetle also. The injury they occasion is the destruction of the entire root system by gnawing off usually short one root after another, but they also gouge out cavities in the root stock itself, single grubs passing through the soil from one plant to another in the row. These destructive grubs have at least two years in the soil, and as they meanwhile persist, generally speaking, in one spot, the continuous damage they perpetrate is considerable. Moreover, since they may pass downwards with the moisture level as the soil surface dries out during drought, their presence may be overlooked and so same individual grubs may destroy successive pineapple plantings. They have been found to yield to the methods applied in subduing sugar-cane destroying *Lepidiota* grubs, although these are not all available, since the pineapple destroying beetle (the parent of the root-destroying grub) does not apparently feed on the foliage of trees or of other plants, and remain on them during the day as do so many of the "cane beetles," and thus they can neither be captured or poisoned as could be done were this habit displayed. On the other hand, they pass the hours of the day beneath the soil to which they repair, only issuing from it as at first—at and just after sunset (during September-October) to swarm and mate when temporarily settled. It has, however, been practicable to capture a proportion of these beetles on emergence since they will remain temporarily settled on any small bushes that may be stuck in the soil whence they are issuing and so may be hand-captured. The destruction of the large grubs in the soil by paradichlorbenzol has been found practicable. The necessary inquiry centering on this destructive insect and its habits is in progress.

Note.—A second, a larger species, of *Lepidiota* of unknown feeding habits occurs in a portion of the district in which this pineapple damaging one is met with. In Southern Queensland a third scarabæid larvæ also gnaws pineapple roots, but not shortly off—possibly *Isodon puncticolle*.

2. "Mealy Bug" or "White Louse" (*Coccida-Pseudococcus* spp.).

What are apparently two different kinds of "Mealy Bugs" have been found associated with pineapple plants. One, occurring especially upon and injuring the root system—and in feeding amongst other places—by suction at the root-ends causing an obscure form of plant failure through preventing their proper functioning—damaging the nutrient-absorbing tissue occurring there, and very harmful when

dry conditions prevail and fresh root-formation is no longer taking place. The other Mealy Bug concentrating its attention principally on the apical growths above ground on either the developing pine or tender leaf-shoot, but infesting the base of older and more developed fruits also. This latter, as we find, is especially harmful in the more northern areas of this State, where its work is facilitated by a special ant, that in return for sweet aliment that it derives from the pineapple-loving insect, protects it from its would-be enemies with a canopy of debris or some other vegetable matter.

The species of *Pseudococcus* concerned have not yet been definitely specifically determined, but two different species of Mealy Bugs are known to attack the pineapple in other countries.

These harmful insects, whose obscure habits lead generally to the damage they perpetrate being overlooked, are, it has been discovered, largely disseminated and so established in clean areas by means of plants used in propagation that already harbour them. This remark, whilst it may refer to both suckers and "nibs," has special reference to "stumps" that are often grossly infested. Any plants that show the merest trace of Mealy Bug presence should be disinfected prior to being sent out or planted. Fumigation for scale insects will constitute an effective method in securing this end if carefully pursued. Experiments involving the use of hot water are projected.

3. The Pineapple Scale Insect (*Coccidae-Diaspis Bromeliaceae*).

This formerly was to be met with in the Brisbane area infesting plants of the pineapple family (*Bromeliaceæ*). Fortunately, it apparently has spontaneously disappeared. In the West Indies and Florida it is one of the plant's worst insect enemies.

THE LARGE FRUITED GRANADILLA.

G. WILLIAMS, Director of Fruit Culture.

The Passiflora family is of wide distribution, several being included in our native flora, but to the introduced varieties we are indebted for their delicious fruits. The passion fruits, of which two are of purple and one yellow, are widely distributed. A recent introduction, *P. ligularis*, has not been sufficiently established to warrant general comment. The fruit is comparatively small—though the foliage more resembles the granadilla—and is of plum colour. *P. laurifolia* is an old identity, but extremely rare. The fruit is very sparsely produced, but the quantity may be increased by hand pollination. It is twice the size of the large purple variety, which it excels in flavour. Recently a fair supply of granadillas, *P. quadrangularis*, has been available on the local markets, but distant transport obviously necessitates their being forwarded in a rather green stage, consequently the flavour is not in many instances fully developed. It is extremely rare that the large-fruited granadilla, *P. macrocarpa*, is seen on the market, though vines are occasionally noted in private gardens. The more fertile soils in some of the higher parts of the metropolitan area are adapted for the production of this highly esteemed fruit. The illustration is of a fruiting vine in Mr. J. C. Brünnich's garden at Taringa, near Brisbane.

The vine may be induced to climb over a trellis but in this way is unsatisfactory, the best results being obtained when grown over a pergola, as shown, covered with open (5-inch) wire netting, or any substantial structure with widely spaced battens. It is found without hand pollination the early flowers fail to set fruit, but later in the season a good crop is carried. In addition to its use as a dessert the granadilla of both types, when properly matured, is prized for culinary purposes, when its succulent pulp protected by a very thin skin is incorporated. The fermented juice of the fruit may be converted into a most palatable wine.

Plants are propagated from seeds or cuttings—planted in early spring. Germination of seeds is accelerated by soaking in hot water for three or four hours before planting. Seedlings will transplant readily, provided the foliage and soft terminals are removed; usually they are pot grown when removal of any portion at the time of transference to open ground is unnecessary.



PLATE 6.—THE LARGE-FRUITED GRANADILLA.

Carrying specimens 9 in. x 17 in. circumference, grown by Mr. J. C. Brümlich, in his garden at Stanley Terrace, Taringa, near Brisbane.

THE LATE MAJOR A. J. BOYD.

Many expressions of regret at the passing hence of Major A. J. Boyd, F.R.G.S., who was editor of this Journal from 1897 until his retirement in 1921, have been received, together with many evidences of widespread appreciation of his worth and work. Included among them were the following Press references:—

From the Sydney "Bulletin," 23rd May, 1928:—

Major A. J. Boyd, man of many parts and fine personality, passed over in Sydney last week at eighty-six. Born in Paris, he came to Australia, after a spell at sea, in 1860, and became one of the early sugar-planters of the Northern State. From that he passed into the Education Department, and later conducted a school of his own which turned out many first-class men. A ripe scholar and an exceptional linguist, he also broke into journalism; he edited the "Queensland Agricultural Journal" from 1897 till he retired in 1921. He was a keen volunteer soldier in pre-Federation days, and held his majority in the old Queensland Garrison Artillery.

From "The Brisbane Courier," 16th June, 1928:—

I was most interested (writes a correspondent) in the article entitled, "The Late A. J. Boyd, Soldier, Sailor, Schoolmaster, and Journalist," written by "Nut Quad." In it the writer remarked that the late Major Boyd was a Frenchman born—and it reminded me that sometimes people had jokingly accused him of being half a Frenchman, because his parents happened to be stationed in France at the time of his birth. His reply was, "If I had happened to be born in a stable would I have been a horse, or, if I had been born in China, would I have been half a Chinaman?" It would have been very hard to find a man who was prouder than he of being British.

In mentioning that the Darling Downs Mounted Infantry was largely the fruit of the late major's recruiting zeal, "Nut Quad" reminded me, too, of the Eton Cadets at his Nundah School, a corps of which he was very proud. All his friends will remember his enthusiasm for soldiering, and those in close contact with him were apt to catch his enthusiasms. Mr. Orlando Daly, a tutor at Eton, Nundah, passed on from that school to the Permanent Force in Brisbane, and so did Mr. J. J. Byron (another tutor at Eton, Nundah), now Major-General Byron (of South Africa). The late Major was very proud of the fact that three of his lieutenants in the Brisbane Garrison Battery when he was in command all became distinguished soldiers, namely, the late Major-General Sellheim, General Foott (our Queensland Commandant), and also General Coxen. General Sir Brudenell White—a Queenslander and one of the greatest general staff officers the war produced—Ed. "Q.A.J."—was a pupil at Nundah, and later on received some coaching from the late Major Boyd for his military career. Others of his pupils included Mr. Justice Lukin, the late Mr. Charles Bright (Postmaster-General), Mr. A. D. Walsh, the late Mr. Gordon Graham (Under Secretary for Lands), Mr. Horace MacPherson, Sir Samuel Pethebridge, K.C.M.G., and others too numerous to mention.

When "Nut Quad" gave a list of the late Major's writings, he forgot to mention the author's book, "The Shellback," in which he gave an account of his life at sea in the 'sixties—and it was to those far-off days that his mind mostly went back in the last few years of his life. These few reminiscences are written by one who knew him very well as soldier, sailor, schoolmaster, journalist, and also a very dear old man. [Major Boyd's literary activities covered a very wide field. In addition to the works already listed, he was the author of "The Colonel's Sons" and other stirring boys' stories. "Geology in Verse," a clever text-book in rhyme, and numerous pamphlets and brochures on agricultural subjects were also the products of his vigorous pen. His general outlook on world affairs was that of a broad-minded, keen-brained, cultured Australian.—Ed. "Q.A.J."]

MANURING OF BANANAS.

In the May issue of the "Journal" the usual formulæ for fertilising of bananas were given, and recommending the use of sulphate of potash as a source of the necessary potash, which is of such importance for successful banana culture. Bananas are one of the plants which like a certain amount of chlorine, and the use of salt is therefore frequently beneficial. By substituting the cheaper muriate of potash for the sulphate the banana crop will be greatly benefited, and muriate of potash can therefore be strongly recommended as a base for all fertiliser mixtures for bananas.

1 JULY, 1928.] QUEENSLAND AGRICULTURAL JOURNAL.

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OBSERVATIONS ON EYE WORMS OF BIRDS.

By J. W. FIELDING, Australian Institute of Tropical Medicine,
Townsville, North Queensland.

THE presence of worms in the eyes of birds was apparently first noted about 1819, when Rudolphi described a number of species. From 1825 onwards a noted collector named Natterer appears to have concentrated his attention on the parasites of birds, paying special attention to the parasites of the eyes. He appears to be responsible for quite half the species recorded to date, which were collected principally in Brazil. They were described by Molin (1860), since when various authors have found and described new species from other parts of the world.

Kreff (1871) first recorded the presence of worms from the eyes of wild birds from the Australian region. These worms were placed in the genus *Ascaris* (*Ascaris* sp.), and were recovered from the Red-wattle bird or Gill bird, *Acanthochaera carunculata* Lath. Johnston (1912) redescribed it as *Ceratospira acanthochaerae*, later placing it in the genus *Oxyspirura*; Railliet, Stiles, and Hassall give the specific name as *Anthochaera*. Von Linstow (1897) found worms in the eyes of Brenchley's Fruit Pigeon, *Zonoenas brenchleyi*, from Bismarck Archipelago, describing it as *Ancyracanthus ophthalmica*; Ransom (1904) brought it into the genus *Ceratospira*.

From 1913 onward special attention has been paid to the presence of worm parasites in the eyes of wild birds in North Queensland. Nicoll (1914) recorded parasites from the eyes of the Wedge-tail eagle, *Uroætus* (*Aquila*) *audax*, and the Brown hawk, *Hieracidea berigora*, which were placed provisionally in the genus *Oxyspirura*. Breinl (1913) recorded *Filaria daceionis* from the Laughing Jackass; *Dacelo leachi*, which was placed by Johnston (1916) in *Ceratospira*; and latterly this species has been placed in the genus *Thelazia* by York and Maplestone (1926). The presence of an *Oxyspirura* sp. from the Sea Eagle, *Haliætus leucogaster* is here recorded. These records form the positive findings of a systematic examination of 250 wild birds for ecto and endo parasites, special attention being paid to the eyes. The list of birds examined includes 109 domestic birds; of the wild birds examined 5 were found to be infected, or 2 per cent. of the total; of the 109 domestic birds 51 were positive, or 46.88 per cent. In the following list of birds examined, the common and ornithological names are given to avoid confusion:—

		Number Exmd.	Nega- tive.	In- fected.
Bee eater (sacred king- fisher)	<i>Halcyon sanctus</i>	1	1	..
Bower bird	<i>Chlamydodera orientalis</i>	2	2	..
Butcher bird	<i>Cracticus destructor</i>	3	3	..
Canary, native	<i>Ptilotis fusca</i>	4	4	..
Cockatoo, black	<i>Calyptrorhynchus funereus</i>	1	1	..
Cockatoo, white	<i>Cacatua galerita</i>	6	6	..
Cormorant	<i>Plotus (Ankinga) novæ hollandiæ</i>	2	2	..
Coot, bald	<i>Porphyrio melanonotus</i>	19	19	..
Crane, white	<i>Herodias timoriensis</i>	2	2	..
Crane, blue-grey	<i>Notaphoyx novæ hollandiæ</i>	2	2	..
Cuckoo	<i>Eudynamis cyanocephala</i>	4	4	..
Cuckoo, chestnut breasted	<i>Cacomantis castaneiventris</i>	1	1	..
Cuckoo, shrike, black- faced	<i>Graucalus melanops</i>	2	2	..
Curlew	<i>Numenius cyanopus</i>	1	1	..
Dove, large (wood-pigeon)	<i>Geopelia humeralis</i>	1	1	..
Drongo, fish tail	<i>Chibia bracteata</i>	6	6	..
Duck, black	<i>Anas superciliosa</i>	12	12	..
Duck, Indian Runner (penguin duck)	?	13	13	..
Duck, muscovy	<i>Cairina moschata</i>	3	..	3
Duck, whistling	<i>Dendrocycna arcuata</i>	12	12	..
Eagle, sea	<i>Haliætus leucogaster</i>	1	..	1
Eagle, wedge tailed	<i>Uroætus (Aquila) audax</i>	2	1	1
Fig bird	<i>Sphecotheres maxillaris</i>	11	11	..
Fowl, domestic	<i>Gallus domesticus</i>	82	34	48
Friar bird (leather head)	<i>Tropidorhynchus corniculatus</i>	10	10	..
Frog mouth	<i>Podargus phalacroides</i>	4	4	..

		Number Exmd.	Nega- tive.	In- fected.
Goose, domestic	<i>Anser cinereus</i>	2	2	..
Goose, pied	<i>Anseranas semipahmata</i>	1	1	..
Grebe, hoary headed	<i>Podiceps poliocephalus</i>	1	1	..
Hawk, brown	<i>Hieracidea berigora</i>	10	9	1
Hawk, sparrow	<i>Accipiter cirrhocephalus</i>	1	1	..
Hen, water	<i>Gallinula tenebrosa</i>	1	1	..
Heron, Nankeen	<i>Nycticorax caledonicus</i>	2	2	..
Honeyeater, blue faced..	<i>Entomyza cyanotus</i>	1	1	..
Ibis, glossy	<i>Plegadis falcinellus</i>	3	3	..
Ibis, straw necked	<i>Carphibis spinicollis</i>	2	2	..
Jay, blue	<i>Coracina robusta</i>	4	4	..
Kingfisher, Leach's	<i>Dacelo leachi</i>	10	8	2
Lark, magpie	<i>Grallina picata</i>	7	7	..
Lorikeet, blue-bellied	<i>Trichoglossus novæ hollandiæ</i>	10	10	..
Magpie	<i>Gymnorhina tibicens</i>	2	2	..
Mocking bird	<i>Anellobia chrysoptera</i>	3	3	..
Mynah bird	<i>Acridotheres tristis</i>	11	11	..
Native companion	<i>Antigone australiana</i>	11	11	..
Oriole, northern	<i>Oriolus affinis</i>	2	2	..
Owl, brown	<i>Ninox boobook</i>	1	1	..
Owl, masked	<i>Strix novæ hollandiæ</i>	1	1	..
Parakeet, red shouldered	<i>Neophema pulchella</i>	2	2	..
Pelican	<i>Pelicanus conspicellatus</i>	1	1	..
Pigeon, barred wing	<i>Phaps chalcoptera</i>	2	2	..
Pigeon, domestic	<i>Columbia livia domestica</i>	9	7	2
Pigeon, pheasant	<i>Macropygia phasianella</i>	4	4	..
Pigeon, purple-crowned fruit	<i>Ptilopus superbus</i>	1	1	..
Plover, spur wing	<i>Lobivanellus lobatus</i>	11	11	..
Rail, land	<i>Eulabeornis philippinensis</i>	2	2	..
Sandpiper	<i>Tringoides hypoleucus</i>	18	18	..
Shag	<i>Phalacrocorax carbo</i>	3	3	..
Sheldrake, white headed	<i>Tadorna radjah</i>	2	2	..
Snipe	<i>Rostratula australis</i>	1	1	..
Spoonbill	<i>Platalea regia</i>	2	2	..
Sun bird	<i>Cinnyris frenata</i>	1	1	..
Swan, black	<i>Cheonopsis atrata</i>	4	4	..
Thrush (babbler)	<i>Pomaterhinus rubeculus</i>	1	1	..
Turkey, scrub	<i>Catheturus lathamî</i>	2	2	..
		359	303	56

Examination of Young Chickens.

Attention is drawn to an examination of one poultry yard, taking only young chickens into consideration. The results are not included in the general list of birds examined. The total number examined was forty-five chicks, ranging from three days to twenty-four days old. The table shows the age and the results obtained, giving positive findings in 32 per cent.

	Number Examined.	Negative.	Infected.
3-day old chicks	8	8	0
7-day old chicks	12	12	0
10-day old chicks	14	12	2
14-day old chicks	3	0	3
18-day old chicks	2	0	2
24-day old chicks	8	1	7
10-21-day old muscovy ducks	3	1	2
Total	50	34	16

Worm parasites from the eyes of domestic birds were first found by Dr. Manson at Amoy, China; these were described by Cobbold (1879) as *Filaria mansonii*. Since that time this parasite has been recorded in other parts of the world, and appear to be closely associated with the two tropical lines of Cancer and Capricorn. The following are the places from which the parasite has been recorded:—Florida (Niles 1904), Ransom; Jamaica (Clark 1904), Ransom; Mauritius (Emmerez 1901); Isle of Reunion (Ozoux 1910); Brazil (Megalhes 1888); Guam Ladrome Islands (Barber 1916); Hawaii (Norgaard 1918); Java (Penning 1894) (Smit 1918); Annam Indo-China (Carougeau 1902); Rabaul Mandated Territory of New Guinea (Heydon 1926), Fielding; New South Wales (Johnston 1909-10); North and Central Queensland (Tryon 1907-8), (Dodd 1909), (Sweet 1910), (Breinl 1913), (Nicoll 1914), and (Fielding 1926); the latter author records finding it in the muscovy duck, *Cairina moschata*.

In a recent paper on the subject, the present writer draws attention to having obtained specimens from inland centres, thereby dispelling the idea that it only occurs on the sea-coast. Ozoux (1910) drew attention to its occurrence in mountainous districts on Reunion. Smit (1918) states that Neveu-Lemaire says that the parasite does not occur on the sea-coast.

As pointed out by Fielding (1926), various experiments have been carried out on the question of the elucidation of the life history, and has himself been working on the question for the past twelve to thirteen years, during which time some thousand or so experiments and dissections, which were the fore-runners of the findings tabulated by him, were carried out. He shows that the cockroach *Pycnocelus* (*Leucophæa*) *surinamensis* L. is responsible for the transmission of the parasite, and succeeded in infecting young and old ducks and young chicks experimentally by feeding the cockroach to the birds, and that the time taken for worms to appear in the eyes of birds, after having swallowed the roaches, is very short.

That there is an association between the eye-worm of poultry *Oxyspirura parvorum* and the cockroach *Pycnocelus* (*Leucophæa*) *surinamensis* in Australia is evident on consulting the map showing the distribution so far as is known at present. This is further accentuated on taking the known distribution of *O. mansonii* and the cockroach into consideration throughout the world, which shows that of the places where the worm parasite is known six have also the cockroach. So far we have no records of the occurrence of the roach in Indo-China, Guam, or Rabaul, Mauritius, Reunion, New South Wales, Florida, Jamaica, but owing to the fact that it has been recorded from adjacent places, it is hardly conceivable that it does not occur in the places mentioned. As regards Florida and Jamaica we would draw attention to Doucette and Smith's statement that it occurs on the eastern portion of the United States, and has also been recorded from Mexico.

General Sanitary and Hygienic Considerations.

It is undoubtedly of first importance that the general sanitary and hygienic condition of the poultry yard should be attended to. Even under the ordinary rules of poultry keeping the first essentials are—open air, light, cleanliness, and careful feeding. Infinitely more necessary is it that these conditions should be given with a disease of such importance as the one under review. It is considered that in an endemic area the poultry yard should have a minimum of shade so that the penetrating and sterilising effect of nature's own disinfectant can be made of more use—viz., the sun. This minimum of shade is not only meant in the ordinary sense but also as regards shade for insect pests in the fowl-house and yard generally. The yard should be thoroughly cleaned, and the droppings cleaned up at regular intervals and spread out in the sun to dry and eventually burned. All bags, boxes, boards, and other material which might serve as hiding-places for cockroaches, crickets, and other insect pests should be burned. Disinfectants should be sprayed at frequent intervals around the fowl-house and shady spots, or powdered lime, borax, or sodium fluoride mixed with flour should be sprinkled wherever cockroaches are prevalent. Recently in the United States, Doucette and Smith (1926) have recommended the use of a solution of sodium cyanide sprayed on the soil for the destruction of the cockroach which is now known to be responsible for the transmission of eye-worms of poultry. As they were working under conditions totally different from those obtainable in a poultry yard, and as this solution is a deadly poison, it should be clearly understood that the birds would have to be segregated during operations, and all refuse and detritus cleaned up afterwards. Even then there would appear to be a certain amount of risk attached to its use, owing to the fact that the fowls scratching around in the soil for tit-bits may pick up some particles impregnated with the compound. On general grounds the feeding should be carried out on the hopper principle, and the drinking water supplied on the fountain system.

Treatment.

Various methods of treatment, aiming at the destruction of the worm parasites of the eyes have been put forward, but to appreciate fully the effects of any treatment, it would appear necessary to point out that there is a wide space all around the eyes communicating with the beak and mouth called the infraocular sinus, through which the tears drop into the buccal cavity, and that the worm can and does pass out from the eyes through this sinus into the mouth, or from one eye to the other, thereby evading for a time the effects of the treatment of the eyes. Obviously, whatever method of treatment is given, it is necessary, to get the best results to carry the treatment to the only means of escape for the worms from the eyes, viz., the opening into the mouth of the sinus. This end is accomplished by painting the opening with the solution by means of a camel-hair brush.



The following solutions have been suggested:—(a) Dropping a solution of sodium bicarbonate into the eyes. (b) A similar proceeding with chloroform. (c) First anaesthetise the eyes with a 5 per cent. solution of cocaine, by drawing apart the eyelids and pouring a few drops of the cocaine into the eyes, allowing this to act for some time, and afterwards drawing up the nictitating membrane and placing a few drops of 5 per cent. creoline underneath. (d) By forcibly extracting the worms by means of a small pair of forceps (this is a dangerous practice and is better left alone). An improvement is here suggested, viz.—a small camel-hair brush. This method has been used for some years and has been found to answer quite well, but requires plenty of time and patience; even this is objectionable

owing to the creation of inflammation of the eyes. (c) Placing a small quantity of turpentine and allowing it to act for half an hour, followed by irrigation of the eyes with lukewarm water. (f) A weak solution of potassium permanganate (Condy's crystals); this is somewhat slow in action, and should be continued daily for a week or so. Further treatment directed at the alleviation and cure of the inflammatory and catarrhal conditions by irrigation of the eyes with a mild antiseptic as 4 per cent. boric acid. Ransom suggests the use of a mixture of nine parts of lard and one part of iodoform or carbolic vaseline.

TURKEY REARING.

P. RUMBALL, Poultry Expert.

There has been a serious falling off in the number of turkeys kept in Queensland during recent years, of which ample evidence is supplied by the Registrar-General in his annual reports.

This decline in numbers cannot be attributed to the lowered value of turkey flesh, as excellent prices are generally realised for good birds in the local markets, and in seeking the cause, one is forced to the conclusion that faulty methods of breeding and disease are the principal factors, although seasons and the ravages of foxes have probably played their part.

Suitable Localities.

The farm, by reason of offering turkeys ample range, thereby enabling them to indulge in some of their wild traits, is its natural home. Free range also enables turkeys to gather considerable quantities of their own food in the form of grass, insect life, and when stubbles are available, grains. Districts in which the soil is of a light nature and undulating is more suited to turkey raising than low-lying wet country. Scrub country offers ideal conditions, especially where there is a good supply of green feed and water.

Housing.

It is natural for turkeys to roost in the open, but, when there is no suitable belt of timber to afford protection, certain housing methods should be adopted to obtain the best results. These houses need not be very elaborate, but should be so constructed as to permit of a free circulation of air. Old open-fronted lofty barns are well suited for this purpose, but in districts in which turkeys have to be protected from the fox it may be advisable to adopt the following system:—Enclose an area of land, about $\frac{1}{2}$ an acre, with a 6-foot netting fence, and build a shed in the middle. This shed should face north, and be open in front with a 6-inch space between the back of the top wall and roof. The dimensions would vary according to the number of birds to be housed, but each bird should have a floor space of 15 square feet. The house should be 9 feet high in front and 7 feet at back. Perches should be about 3 feet high, all on the same level and 3 inches wide. Suitable nests could be placed around the enclosure and made to look as natural as possible with the help of bushes. The turkeys could be confined to these quarters at night, and allowed range during the day.

Breeding Stock.

There are several varieties of turkeys, but the American Bronze holds pride of place. This is a large and hardy breed, which has supplanted most other breeds, and appears to be well suited to our climate as well as our markets. Mature stock should only be used for breeders, two years and over being more suited than stock only a year old. One vigorous Tom can be mated with as many as ten hens, but probably six to eight females on the average would give better results.

In selecting, strength and vigour, coupled with the knowledge that your stock are from healthy parents, is of primary importance. The head should have a clean and healthy appearance, body compact and long. Sturdy shanks and strong toes with fair-sized bone indicating stamina.

Extra heavy show specimens do not make the best breeders. What is required, is stock in good hard condition and not fat; on the other hand, stock that are thin should never be used, as the lack of condition may be due to some inherited weakness. Hens weighing 16 to 18 lb. and Toms 25 to 30 lb. in fair condition will be found to give satisfactory results.

Avoid in-breeding and endeavour to obtain occasionally new Toms from reliable stock, but before buying make sure that he comes from healthy parents, and take further precautions by isolating him for some two or three weeks. The best hens raised on the farm should be reserved for breeding purposes, and not sold because there is a good market.

Hatching by Natural Methods.

Vermin must be carefully guarded against and when nesting in enclosed quarters, both the hen and the nest should have a good dusting with insect powder for a start, and again a few days previous to hatching. By taking these precautions you assure the young poults of a start in life free from vermin, which is a great aid to successful rearing. A turkey will only cover properly fifteen to eighteen eggs, and it is a good plan to set a few eggs under broody hens at the same time as the turkey is set, and when hatched to give all the chicks to the turkey, as she can comfortably mother about twenty-five. Food, water, and grit should always be handy to the sitting hen, and if the Tom is at all savage it is advisable to protect the nest and young.

Rearing.

It is found best to let turkey hens mother the chicks. When hatched, the young poults should be left undisturbed until thoroughly dry, they then may be temporarily removed to induce the turkey to remain on the nest, if it is found that the eggs are hatching irregularly. After the hatch is complete a coop which affords protection from wind, rain, and dampness should be provided. This coop should permit of a free supply of air and be moved on to new ground daily. The hen and poults should be confined to the coop for ten days to a fortnight, but if the weather is fine the poults may be allowed a little liberty when the dew is off the grass; after this period it is generally safe to allow range, providing the grass is not too long and wet. When they have reached the age of five weeks, entire liberty can be given, allowing them to roost in barns, houses, or trees, according to the policy adopted.

Feeding.

No food should be given for at least forty-eight hours after hatching. Hard grit, charcoal, and water should be the first food provided. The hard grit assists in mastication and charcoal has no equal as a bowel corrector. Turkey chickens will gorge themselves if allowed, and this gorging is responsible for a considerable amount of trouble. Turkeys in their wild state would gather their food very slowly, and it is found best to imitate them as far as possible by only feeding the young chicks a little at a time and fairly frequently. This prevents them from over-loading their digestive organs and helps to retain that keenness of appetite which is essential to successful raising of poultry of all kinds.

Stale bread soaked in milk and then squeezed fairly dry is the most handy food on the farm and also gives excellent results. This can be fed five times a day for a few days, and variety can be made by the replacement of some of the meals with chick grains, mashies of brand and pollard mixed with milk, to which can be added a small amount of minced meat and tender green feed. This mash should be made crumbly and not sticky. When on range the quantities of food will vary according to what they can gather for themselves, but surplus milk can be fed at all times either thick or fresh, but it is as well to always feed it in the same condition. Green feed should be fed in abundance to both growing and adult stock, but where range is allowed on good green pasture it is not so important.

Grains should always be fed at night and so induce the flocks to return to their camps. Oats, maize, and wheat are suitable for this purpose.

In the management of turkeys, especially in the rearing of young stock, cleanliness is essential. Food should not be allowed to lie about or become decomposed, and a strict outlook must be kept for vermin of all sorts.

Diseases in Turkeys.

Turkeys are subject to practically the same diseases as other classes of poultry, but mention is made here of the most common and devastating diseases affecting the problem of turkey raising.

Black-head, Hepatitis, White Diarrhoea, &c.

This disease was given the popular name of black-head owing to the darkened appearance of the head of affected birds. The general adoption of the name is unfortunately misleading, as the darkening of the head is not noticed in all cases.

Old and young stock are affected, but heavy mortality is principally met with in young stock a few weeks old. The external symptoms are drowsiness, lack of vigour, and loss of appetite. Diarrhœa is nearly always present and of a yellowish colour, though sometimes white, due to the abnormal percentage of urates. The disease usually appears in the intestinal tract, the cæca being the most seriously affected. The liver quickly becomes affected.

Cause.—Bacteriologists do not agree as to the particular organism which causes this disease, but they do, however, assert that it can be transmitted from mother to progeny by means of the infection of the egg, hence the necessity of obtaining stock free from the trouble. It is also readily transmitted from one bird to another through food coming in contact with the droppings from diseased stock.

Medicinal treatment has not proved successful, but where stock has been recently infected the following remedies may be adopted as a means of arresting the disease:—Thorough cleanliness of quarters and disinfection with a 5 per cent. carbolic acid solution. A teaspoonful of hydrochloric acid to a quart of drinking water often gives good results. Sour milk, by its action in keeping the intestinal tract in an acid condition, is also of value.

MAIZE AND LUCERNE.

Maize is one of the most valuable cereals grown in the State, and is used extensively as a fodder in the drought periods, saving thousands of merino sheep that are now grazing on the Western downs.

It is difficult to over-estimate the value of such fodder crops as maize and lucerne and the service they render to the live stock industry in the trying periods of drought. The value of the activities of our agriculturists throughout the State cannot be solely estimated on the basis of the market value of the maize and lucerne produced. To such values must be added that of live stock saved by feeding drought rations of maize and lucerne and so preserving an industry that contributes largely to our national wealth.

Favourable seasonal conditions have yielded heavy crops of these fodders, but market values have fallen below the cost of production. A surplus over the immediate market requirements depresses values, and the producer suffers in consequence. With our varying climatic conditions surpluses and scarcity of fodder often follow at intervals that are altogether too brief.

Conservation of fodder is of really vital importance to us all. Lucerne and maize are especially suitable for conservation purposes. Our pastoralists where practicable might insure the lives of their stock by purchasing and storing maize and lucerne hay in silos or lofts. At the market prices ruling in times of plenty for such products the premium is most reasonable. By taking steps in time to make their position more secure, they will also render a great service to primary producers engaged in the production of fodder crops by stabilising the market for them.

The menace of a prolonged dry spell has been lifted from most of the pastoral and agricultural areas of the State, and the future of both will be brighter and more secure if those controlling the pastoral industry will, where possible, make a special effort to purchase maize and lucerne for the purpose of storing for a lean period. Seasonal conditions will repeat themselves, and a period of high production is frequently followed by a subnormal season.—From Field Notes—by C. McGrath, Supervisor of Dairying.

A FARMER'S APPRECIATION.

Renewing his subscription, a Nambour farmer writes—

"I would like to add my congratulations to the Department for making available, at a small cost, such valuable information to the man on the land."

CLASSING SMALL CLIPS.

From a radio address by Mr. J. CAREW, Acting Instructor in Sheep and Wool, and continued from the June issue.

Marketing Wool.

The system of placing wool on the market must be taken into consideration. Five bales of wool, each 200 lb. or over, of a given class are placed in the general catalogue by the wool brokers, and therefore meet with keener competition at the auction sales than if in lines of less than five bales each. The latter are placed in the star lots, where speculators usually buy them up to repack into longer lines to be again put on the market in the general catalogue. In the classing of small clips the fleece wool should be worked into bulk lines. The main idea being to class into lines as even as possible, but at the same time make as few sorts as possible. There are three chief factors that are taken into account by the buyers when coming to a conclusion on the value per lb. of greasy wool—namely, spinning qualities, length of fibre, and yield. In the lastmentioned is meant the actual weight of clean dry fibre, after all yolk, vegetable, and other extraneous matter are removed. Length of fibre is considered in respect to the process to which the different lengths of fibre are suited in preparation for yarn and subsequent manufacture. Spinning quality means the actual length of yarn that can be spun per lb. of top or sliver.

Woollen yarns differ from worsteds in that they contain all the fibres that are in the particular class of wool from which the yarn is spun. Worsteds on the other hand have all short, weak, knotty, and cross fibres combed out before they reach the process of spinning. All fibres are lying parallel to each other, thus enabling them to be drawn out and spun into a more symmetrical and even yarn. To suit this combing process the wool must be of a given length, at least 2 in. for English and Australian manufacture for worsted top making, while on the Continent shorter wools can be used; they must, however, be sufficiently strong to withstand the strain of the combing machines.

In merino combing wool we have what are known as the warp and the weft classes, which indicate the requirements for the weaving of worsteds. In this respect the threads that form the foundation of the cloth are known as warp yarns, and are placed lengthways in the loom. These warp yarns are spun from a sound wool of a greater length than the weft yarns which can be much weaker, just sufficiently strong to stand the weaving as they form the cross yarn to be woven into the fabric.

It can readily be observed that the grower's main object should be to have the wool classed to meet the demands of those purchasing the wool for manufacture, thus enabling them to secure the desired class for their special purpose. These top makers use combing wools only, and if any wools are included that are too short or too weak for top making purposes they must get rid of it again.

The Departmental Wool Scheme.

If the flock is so small that the fleece wool cannot be got into the bulk lines, and is still kept fairly even in length, spinning qualities, and condition, the grower is going to sell his best wools at a disadvantage, for the value is likely to be based more on the low wools contained in the parcel. It is because of this disadvantage under which the farmer with a small flock is suffering that the Department of Agriculture and Stock receives and classes any farmer's clip from flocks of 1,500 sheep and under. No lot is too small for consideration, and all wool received is classed according to its grade. When these wools are received they are weighed and an average value placed against them. If required, an advance of 60 per cent. on the Departmental value is remitted to the owner without delay. The balance due is forwarded, less expenses, on realisation in the market.

In grading these wools, the main features considered are length, colour, condition, and soundness, and the several qualities found in merinos and other different breeds and grades. Each separate class is a distinct and even line, showing the particular type to which it belongs. A line may contain any number of farmers' wools, each of which has been weighed as it is sorted into the respective classes and placed in the bin. The only preparation necessary on the part of the grower is the rolling of the fleece having the tip sides inward, after the dags and stains are removed, before being placed in the bale or other package. When the wool is baled, a distinct brand should be placed on the cap of the bale. Under this scheme handling and all other charges have been reduced to a minimum, in order to encourage farmers to keep sheep even if only in a very small flock.

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*Extract from Letter received from Messrs.
S. Wilson & Co., per B. E. Wilson,
Tenandra Park, GUNDAGAI*

"We feel we cannot let this opportunity go by without saying how pleased we have been for the past four years, since we have been using Vita Lick. We have used the above product continuously since then upon the whole of our flock, and our experience has gone to show that there is no better Lick on the market. We are also pleased to say that we have had beneficial results from N.P. Drench."

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DROUGHT FEEDING OF STOCK.

By RALPH V. HOLE, Manager of Warrana and Bimble Stations,
Coonamble, New South Wales.

Some time ago the "Pastoral Review" offered three substantial prizes for the best contribution by subscribers or their managers or overseers on actual and practical experiences in the drought feeding and management of stock. Following is the first prize essay which is reprinted from the "Pastoral Review" for last April, and to which we are indebted.

THIS essay covers experience of hand-feeding over a period of almost seven months. Commencing on 6th May with 10,000 sheep, the numbers were increased until a maximum of 88,000, including 13,000 April-May lambs, were being fed, and finally ceased 3rd December, when sufficient natural feed was available.

Following a prolific growth of herbage in the winter and spring of 1926, the early summer was dry, and although large quantities of dry herbage remained, sheep did not thrive on it, and toward the end of the year rapidly lost condition. The low nutritive value of the dry herbage was very unusual; this was attributed to fouling by aphids and a species of caterpillar, also to the sudden advent of summer heat while the growth was still sappy and overgrown, which prevented it from coming to maturity and seeding. It was noticed that a great deal of trefoil did not seed, and where the seed did form that it contained no kernel.

Three hundred and twenty-three points of rain in January, 1927, gave temporary relief, but was not followed up, and during the succeeding eight months only 3.36 inches were recorded, and that in small falls of no value. By the end of April most of the country was getting bare and stock commencing to lose condition, so hand-feeding was resorted to in May. The extremely cold winter—the severest for many years—made conditions very hard for stock. Heavy frosts, followed by bleak winds during the day, prevailed for weeks, and stock on the open country got no relief, day or night, and with drought thrown in made it the hardest time in my experience. These introductory remarks may convey to the reader the general conditions prevailing prior to and during the drought.

When to Commence Feeding.

In all cases hand-feeding was resorted to while the stock were in really good condition, and a little natural feed remained, and to this undoubtedly the ultimate success of the operation was due. Commencing with a small ration, the sheep were used to and thoroughly broken in by the time they were altogether dependent on the artificial feed. They retained their condition for many weeks, whereas had they been left until their condition was gone, it would have been almost impossible and prohibitive in cost to build them up again. A good reserve of strength and stamina is necessary, otherwise a heavy loss may occur when rain does come, either from bogging in heavy country or if full-woolled from inability to carry the wet fleece, and this when relief is actually in sight.

Again, in wet weather, except on very favourable country, it may be impossible to feed, owing mainly to difficulty of transport and waste. I cannot emphasise too strongly the vital importance of commencing early while sheep are in good condition. This particularly applies to ewes in lamb, and will be the means of minimising loss in both ewes and lambs.

Selection of Feeding Grounds.

These were chosen close to water, on hard, level ground, free from holes and cracks. The sites were selected with sufficient area to permit of moving to either side as the ground became dusty, and after a spell the wind cleaned the original ground ready for use again.

Method of Distribution.

Motor vehicles were chiefly used to distribute the feed from depots, made at convenient places to serve several paddocks, and which were kept supplied by the heavier lorries carting from the railway. The sheep were quietly mustered to the feeding ground, and the feed trailed in a thin stream from the corner of the bag in a complete circle around them. They were then moved on to the trail, and held for a couple of hours. In some cases a little lucerne hay was used to coax them to take grain—maize being spread about, and on the hay. This procedure was only adhered to until they took to the feed, and then broadcasting was adopted.

The feed was tipped loose in the lorry and mixed, and on arrival at the ground where the sheep were mustered ready, the driver quickly circled round the mob, and then backwards and forwards through the centre, the second man broadcasting with a wide shovel, one throw to the right, the next to the left, giving the shovel a swish to distribute the grain over the greatest possible area, to avoid crowding. Where lucerne hay was used, it was left in the bundle with the bands removed for the sheep to pull at themselves. Opening it up proved too wasteful.

Sheep soon learn to draw to the ground of their own accord, but always the paddocks were ridden, to make certain none were away. Lambing ewes were successfully fed in this way, the only difference being any ewes with green lambs were left alone until they came in themselves. Being broken in beforehand, they were very little trouble, and loss in lambs was very little above normal. A horseman was always at the feeding ground to hold the sheep and prevent them rushing to meet the lorry and from following it away.

It was found necessary to have the sheep at the ground to rest awhile before being fed, otherwise weak sheep were tired and not inclined to feed. To avoid mustering to a central ground, we tried running round the paddocks and feeding wherever they happened to be. This method was an absolute failure and speedily abandoned for the reasons that the sheep knocked themselves about racing after the lorry, and it was impossible to feed them properly and ensure an equal ration.

In some lots the "tail" sheep were drafted off and fed with a heavier ration, which proved successful in levelling them up again. Between 10 a.m. and 2 p.m. proved the best time to feed. Earlier, the sheep, instead of drawing in themselves, had to be driven, and later got restless and inclined to walk off the camp. Flock sheep were fed in lots of from 500 to 2,000, and although one lot of 3,400 was successfully handled, the smaller lots were easier to feed.

Ration per Head.

The daily ration was 2 oz. per head for the first month while they had a little dry feed. It was then increased to 4 oz., at which it remained for from two to three months, sheep doing well on it. As the weather became colder and the country devoid of feed of any sort, it was again increased to 6 oz. Towards the end of the drought a further increase to 8 oz. was made in some lots, but it was noticed that no improvement came with the last increase.

This confirmed a previous experience that there is a limit to the time sheep will thrive on a concentrated ration alone, and must have bulk with it. With paddock roughage or scrub, they will do well, and always provided feeding is commenced in time, will carry on for from eight to ten weeks on the concentrated ration alone, but after this period will cease to thrive. To combat this, in October and November, some lots were given $\frac{1}{2}$ lb. lucerne hay daily, the maize, &c., being cut down to 4 oz., when the improvement was immediate and most marked. The best results were obtained with 4 oz. for the first period, and then 6 oz., and when they ceased to thrive on this, 4 oz. grain and $\frac{1}{2}$ lb. lucerne hay. The feed consisted of half maize and half either Thorpe's Kubettes or Meggitt's Nuts. The commencing ration of 2 oz. is only of benefit with a fair amount of natural feed, but serves to break them in.

Ewes rearing lambs were allowed the same ration, with an addition for the estimated number of lambs in each lot. With ewes in lamb, it is necessary to give hay or bulk as soon as paddock roughage becomes scarce. Stud sheep and flock rams were fed 6 to 8 oz. maize and Thorpe's Kubettes, and $\frac{1}{2}$ lb. to 1 lb. lucerne hay, and did very well, finishing in fine condition.

Value of Fodders Used.

Maize, Thorpe's Kubettes, Meggitt's Nuts, and lucerne hay were used, and with one lot of lambs and some cattle, several stacks of old coarse wheaten hay. Scrub was only available in a few paddocks—box, wilga, and belar were used in these. Maize was used as the foundation feed, and it is undoubtedly the best. It is both sustaining and heating, is easily handled, there is no waste, and when broadcasted, sheep have to search for it, thereby giving the weak sheep and slow feeders a chance to get their ration. The big flat-grained maize, either white or yellow, was found to be fully 33 per cent. of more value than the small, hard, red variety. At one period we had to use several trucks of the latter variety, and the result was immediately noticeable, the sheep cutting up badly.

Thorpe's Kubettes, containing as they do a variety of grain, all of good feed value and a high percentage of proteins, are an excellent fodder, especially when

fed with maize, and were used largely with success. This particularly applied to weaners and young sheep. They take readily to them and do not go "stale" as on maize, and will hang on for a long period. The same applies to Meggitt's Nuts, the oil contents of which are valuable and which perhaps are superior for lambing ewes and during period of gestation. It is a good milk producer and is laxative, the latter quality being noticeable in the moist and soft droppings of the sheep.

The three varieties of scrub were used with maize, &c., but were found to be of low value and hardly warranted the expense of cutting. They certainly were of some help with young sheep, but with aged ewes and ewes in lamb caused mortality, and were discontinued.

Coarse, dry wheaten hay, containing no grain, was fed to one lot of 2,000 lambs. They were taken from their mothers at three months and put in a 10-acre paddock. The hay was fed at first moistened with molasses water, and later they were given access to the stacks. In addition they had the ration of 1 oz. maize and 3 oz. Kubettes. They held their condition for over two months, and until sent away on feed in November. An outbreak of eye blight, commonly known as "Pinkeye," caused a small mortality among them. Seventy cows suckling calves were also fed with this hay well moistened with molasses, being allowed 10 lb. daily, it kept them for three months. The dry cattle eked out a living on belar, which they themselves could reach, and although they lost condition, managed to survive until both lots were sent away in November. Lucerne hay proved excellent fodder for both sheep and cattle, but its value is largely discounted by the high cost of handling, the large percentage of waste, and the impossibility of ensuring an equal ration for each individual.

Water.

Bore water of excellent quality was available in most paddocks. The drains are small and were frequently delved and kept in order so that sheep got a drink of fresh, clean running water without congestion or crowding, and without bogging. With any of the ground tanks in use that commenced to bog, the batters were cleaned with a "Nelyambo" scoop, leaving a clean, hard surface; one cleaning sufficed for from six to eight weeks. Some of the tank water, when low, was inclined to become stale; an improvement was noticed among sheep moved from this to bore water.

Lambing.

Owing to 68 per cent. marking in December, 1926, the autumn drop was light, being 31 per cent., except with 6,000 ewes, not previously joined, which marked 84 per cent. Most of the ewes were fed while lambing, and reared their lambs for about ten weeks and then weaned them. No loss was incurred from marking, but a mortality estimated at 15 per cent. occurred from malnutrition, when the lambs first took to the feed, and for which maize was responsible. When they first take to feed they are inclined to swallow the maize whole. Had we been able to confine their ration to Kubettes this loss would not have occurred, as this feed is readily digested even by very young lambs.

The balance eked out a living on the feed until relief came, and are now growing and doing well. In all, 13,223 lambs were marked in June, and shearing count in October was 9,829, a shortage of 25.66 per cent. Rams were joined in June, and we are now (January) marking a 65 per cent. drop.

Shearing.

This work commenced at Warrana, 1st July, and at Bimble, 25th July, and both sheds cut out 19th August. We were anxious to complete this work early and get the wool off, but, as the season turned out, it was too early, and the exceptional cold caused losses. Feeding was continued at both places during operations, with the only difference that sheep being handled were fed twice daily, and for convenience feed depots were made along the routes to the sheds.

Sheep were yarded in small lots, just sufficient for half-day's shearing, and only ewes and lambs were drafted. Immediately prior to entering the shed they were fed, and straightaway after each run of shorn sheep was counted they were let out and fed and removed to the most sheltered paddock available. On many occasions the sheep shorn during the last run at night were fed and put back under cover for the night, and to gain time for this the clock was put forward thirty minutes. These precautions were successful in avoiding heavy losses which occurred elsewhere off-shears. Only one lot of lambs was shorn at this time, the balance being shorn at the end of October.

Licks.

Salt and molasses were freely used and proved beneficial, molasses being both nutritive and laxative. Vita Lick (drought formula) was also used with good results, although a little difficulty was experienced in getting sheep to take to it. In my opinion, a lot more use could be made of scientifically prepared licks in both good seasons and bad. By this I do not mean any haphazard mixture, but a corrective lick, prepared after an exhaustive analysis of soil, water, and natural fodder in various localities, and this would be welcomed by pastoralists generally.

Losses.

In the drop of autumn lambs, losses already have been dealt with. The extreme cold during August and September was responsible for the greater part of the loss incurred, and sheep even in fat condition cut up badly for some time after being shorn, and continued to do so until the advent of the warmer weather.

The loss "in the wool" was negligible, and all sheep went to the shed in good condition. The heaviest losses occurred in one lot of 20,000 December 1926 drop weaners, and three small lots of aged ewes. The weaners had a check, when dropped, from which they barely recovered, when drought conditions again prevailed. They proved an extremely hard lot to handle, being shy feeders, generally very touchy, and at an awkward and delicate age. The loss in these was 11.22 per cent.

The aged ewes died after being shorn, and again a heavy mortality occurred in November, just before they were due to lamb. Had the value of these ewes justified it, a ration of hay would, I am sure, have saved most of them. The paddocks were absolutely devoid of feed of any sort, and all they got was the concentrated ration, which carried them along until about a month before they were due to lamb, when they ceased to do on it. Their age and value did not warrant any further expense in trying to save them. The loss, finally, in these was 50.55 per cent. In the balance of almost 50,000 sheep, comprising ewes one to 4 years old, and rams, the loss was 5.10 per cent.

Costs.

These are computed at per 1,000 for the calendar month, and include all expenses mentioned:—Cost of fodders used, with rail and road freight; cost of distribution, including running costs of motors, and wages of men looking after paddocks. Deduction of rail rebate on fodder is also taken into account.

The daily ration of 2 oz. maize and 2 oz. Kubettes, £47 4s. 8d., or 2 oz. maize and 2 oz. Meggitt's, £53 18s. 2d. per 1,000.

The later ration of 3 oz. maize and 3 oz. Kubettes, £68 5s. 11d., or 3 oz. maize and 3 oz. Meggitt's, £78 6s. 2d. per 1,000.

The last ration used of 2 oz. maize, 2 oz. Kubettes, and $\frac{1}{2}$ lb. lucerne hay cost £90 15s. 8d. per 1,000.

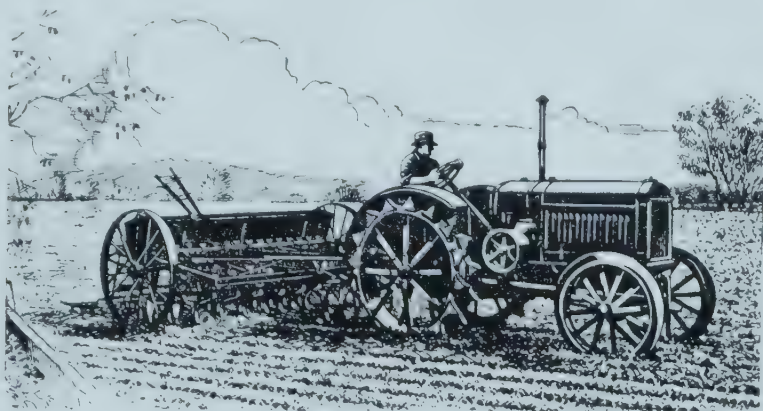
These figures are taken from the actual cost of handling and feeding one lot of 14,000 sheep, and are as nearly accurate as possible.

Conclusion.

From 15th July to 8th August, 3,770 killable aged ewes were sent to Flemington, in the wool; 6,400 ewes were sold and delivered off shears in August. Following relief rains in other districts, from 10th October to 14th November, 31,770 sheep were trucked to various destinations on agistment. These comprised 14,000 ewes forward in lamb, the balance being young dry sheep. They were given an extra ration of grain and $\frac{1}{2}$ lb. hay before being trucked, and not one death occurred in the trucks, but a small mortality was met with after they reached the feed. The balance remaining was fed until relief came in December.

The experience contained in the foregoing proves it is only possible to feed sheep with success on a highly concentrated feed that is easily and economically transported and handled, and convenient rail facilities must be available. A whole ration of any bulk fodder is prohibitive in cost and wasteful, and owing to the difficulty of quick distribution it will be found impossible to ensure an even ration.

The most important factors toward success are to commence early and conserve the condition on the stock, regular feeding, also measuring all quantities, and constant personal supervision to direct the frequent small changes necessary, and which will, at once, be apparent to the eye of the practical sheep man.



More Work to the Gal. on Cross

MINYIP,
5th September, 1927.

I have much pleasure in giving you the results of a kerosene test I held in my Vickers-Aussie to-day, drawing a 19 Tine Scarifier. I used a gallon of kerosene in each test, and marked the distance run on same. I used Cross Kerosene, "....," "...." and "...." Cross was the best of all, and the following is the distance put up by each kerosene:—

"Cross" Power Kerosene	- 106 chains
"....,"	105 chains
"....,"	97 chains
"....,"	99 chains

I would like to say that I held this test to convince myself.

(Sgd.) R. SCHURMANN

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This is the top-dressing of paddocks with Superphosphate, by which means double the number of cows can be carried in better condition, and the manuring of maize and other fodder crops, resulting in better yields having a higher feeding value.

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SOME ASPECTS OF STOCK-FEEDING IN AUSTRALIA.

By E. H. GURNEY, A.A.C.I., Senior Analyst, Department of
Agriculture and Stock.

Paper read at the Hobart Meeting of the Australasian Association for the Advancement of Science, January, 1928.

THE great areas of grazing land in Australia with their varying soil types, climatic conditions, and plant growth, in conjunction with financial, labour, and market conditions, have influenced the existing methods of stock feeding of this country.

A review of the stock-feeding methods in Australia then would demand that all the foregoing factors be taken into consideration, but this paper only touches upon a few aspects of the matter which, though recording data already known, it is thought, if such were appreciated more generally by the stock feeder, the result would be beneficial, both to the individual and the Commonwealth.

The Importance of Mineral Salts in Stock Food.

It is interesting to mention some statements that have been made in literature concerning the importance of mineral salts in the food of stock.

The following extracts are from "Farm Foods," Emil Wolff (English Edition, 1895):—

"Lack of potash is not a probable contingency, as it always occurs largely in vegetable foods. The addition of lime and phosphoric acid to the diet of milch cows is always worth consideration, but is not often necessary."

Again—

"In feeding young animals the greatest care is necessary with regard to the phosphoric acid and lime in the food supplied. The other mineral constituents, such as potash, magnesia, and iron are always supplied in plenty and need no especial provision."

Wolff, in illustrating rations deficient in lime and phosphoric acid, states—

"The addition of a little chalk to the food in the form of powder or of 'lick-stones' is evidently desirable under such conditions of feeding as the above. Phosphoric acid can be provided artificially in the form of phosphate of lime. Experiment has shown that this latter substance is capable of assimilation by calves and lambs, and it has been found of great benefit to foals.

"The food of young animals reared artificially should always contain two to three times as much lime and phosphoric acid as that actually required by the animals."

In "The Feeding of Animals," W. H. Jordan, 1901, the following occurs:—

"The ash or mineral part of plants or animals occupies a minor place in the discussions which pertain to the principles and problems of animal nutrition. Much is said and written about the carbon compounds of living organisms, but the compounds of the mineral world, in their relation to foods and to the processes of growth, are generally passed with brief comment, much less than would be profitable. It is certainly desirable to gain a clear understanding of the combination, distribution, and functions of these bodies. Their importance as necessary constituents of foods and animals is no less than pertains to the carbon compounds, although their scientific and commercial prominence as related to animal nutrition is much less."

J. Alan Murray, in "The Chemistry of Cattle-feeding and Dairying, 1913," after mentioning the function and value of ash ingredients, states—

"To sum up, it may be said that of the ingredients of the ash some are of vital importance in the economy of both plants and animals. Others, though normally present, are probably not indispensable, but may be of use indirectly. From the point of view of the practical feeder, they are all unimportant inasmuch as they are always present in the natural food of the animals. If the food be sufficient in quantity and suitable in other respects, it will certainly contain enough 'mineral salts' for all ordinary purposes. It is unnecessary, therefore, to add any ash ingredients, except common salt, to the ordinary rations of animals."

The following extracts are from "Feeds and Feeding Abridged," Henry and Morrison, 1926:—

"The common feeding stuff contain all the necessary mineral salts, at least in small amounts. As a rule, the roughages, except some of the straws, are much

richer than the grains in mineral matter. Moreover, the body is probably able to use many of the mineral compounds over and over again, taking them back again into the circulation after having been used. Therefore, for most animals which have finished their growth, the usual rations containing good quality roughage furnish sufficient mineral matter, except common salt. As shown later, it is advisable to supply farm animals common salt in addition to that in their feed. Since large amounts of lime and phosphorus are needed to build the skeleton, these elements may fall short in rations for young animals. Also, as is pointed out later, high-producing dairy cows may sometimes be benefited by a mineral supplement furnishing calcium (lime) and phosphorus, for milk is very rich in these mineral nutrients. Over 90 per cent. of the mineral matter in the skeleton consists of calcium and phosphorus. When the supply of either of these is low in the feed, the skeleton acts as a storehouse, doling out these mineral elements so that the life processes of the body may continue normally for a time. But such withdrawal of mineral matter from the bones makes them porous and brittle. Indeed, in certain localities where the hay and other roughages are unusually low in calcium and phosphorus, due to the poverty of the soil in these elements, the bones of farm animals may become so brittle that they break with surprising ease, &c. Fortunately, roughage from the legumes, such as clover, alfalfa, and cowpea hay, is rich in phosphorus and especially in calcium, &c. When there is danger of a deficiency of either calcium or phosphorus, it is wise to add a supply to the ration. Calcium may be furnished cheaply in ground limestone or wood ashes, and both calcium and phosphorus in ground rock phosphate, ground bone, or bone ash."

The foregoing extracts denote that the fact that mineral salts in stock foods was essential was recognised, but that in later years the possibility of a shortage of these ingredients in stock foods emphasised, and within the last few years a large amount of investigational work has been conducted in different countries of the world in connection with pastures, and the mineral content of their herbage. Mention of a few only of these researches will be made here.

Experience in Other Countries.

Theiler, Green, and du Toit (1) reported that, owing to the low phosphorus content in soils of a large area of the Union of South Africa, a relationship between phosphorus deficiency of the pastures of these areas and aphosphorosis in cattle was found. Davis (2) points out a connection between low milk supply and low percentage of phosphorus in crops and soils in the Bihar district of India. Armstrong (3) concludes that the best grazing land is always associated with soils rich in available phosphates and that inferior herbage of pasture is generally due either to the soils being deficient in available phosphates or in bad mechanical condition.

In a paper of this length it is impossible to give even a brief summary of the comprehensive work, "Investigation on the Mineral Contents of Pasture Grass and its Effect on Herbivora," by Elliott, Orr, Wood, and collaborators (4), of which five reports are already published, but one or two extracts of these reports are given below.

Elliott and Crichton (5)—"Pasture analyses show that these grave mineral deficiencies do actually occur in large pastoral areas, and that these areas are correlated with high stock death rates. The mineral elements of the ration are therefore no less important to the pastoral farmer than to any other stock feeder."

Godden (6)—"The percentage of silica-free ash in the 'not eaten' grass from the hill pastures is only approximately 50 per cent. of that in the 'eaten' grass. This deficiency is fairly uniformly distributed over the ash constituents with the possible exception of sodium."

Godden (7)—"Analytical data are recorded which indicate that the application of artificial fertilisers to grass land may result in considerable modifications in the mineral content of the herbage of these pastures. The constituents which appear to show the biggest variations are calcium and potassium and, to a lesser extent, phosphorus. Coupled with any marked increase in the calcium content of the herbage, there is generally to be found an increase in the percentage of nitrogen."

Australian Pastures.

In connection with stock feeding in Australia it has to be recognised that there are areas of land, both on the coast and inland, that are deficient in phosphates, and also that, by a method of continuous cropping or of grazing without some means

being taken to at least maintain the phosphate content of the soil, these areas are continually being increased. It is not contended that phosphate deficiency is the sole factor in causing the breaking down of what was once good grazing land, but it is thought that such deficiency is a big factor, and at times the determining factor.

In feeding dairy cattle, the system of allowing the stock to graze upon cultivated fodder crops for a certain time and then turning the stock into grazing paddocks is becoming a somewhat usual practice in Queensland, and it is thought in other States also.

The actual determination of the amount of nutrient and mineral obtained by stock feeding in the above-mentioned way becomes a difficult problem, for, the different rates of feeding by the individual animal, and the growth of the grazing areas of both fodder and grass, whether regular or irregular, will have to be taken into consideration. If the stock are herded on a restricted area and the fodder grazed practically to the ground, a fair estimation of the food consumed will be possible. As in the case of feeding weighed rations, the financial aspect has to be considered, so also when the above method is followed the experience of the stock feeder will be called upon to decide how long to graze his stock upon any particular fodder crop to obtain the most profitable returns.

Variation of Feeding Values—Queensland Experience.

The variation in feeding value of pasturage at different periods of growth has always had some recognition, but within the last few years more detailed determinations have been made of the nutrients existing in pasturage in different stages of growth.

Referring to the protein content of grass at different stages of growth, the following figures are extracted from Annual Report (1914), J. C. Brännich, Agricultural Chemist, Department of Agriculture, Queensland. The percentage of crude protein is calculated on water-free material, and this figure is extracted from analyses of grass samples collected as representing different stages of growth:—

<i>Paspalum dilatatum</i> (Esk District).				Flinders Grass (Cunnamulla District).			
Crude Protein.				Crude Protein.			
Young, thinly grassed, March, 1914 15.64				Winter, matured, August, 1913 4.52			
Midgrowth, May, 1914 10.80				ditto 3.83			
Mature, March, 1914 6.35				Midgrowth, March, 1914 7.96			
Midgrowth, May, 1914 9.93							
Mitchell Grass (Cunnamulla District).							
Crude Protein.							
Winter, mature, August, 1913				4.02			
Midgrowth, March, 1914				8.76			
Winter, mature, August, 1913				3.79			
Midgrowth, March, 1914				7.90			
Approaching maturity, May, 1914				5.45			

Wood, Blunt, and Stewart (8) have made a very comprehensive investigation concerning the nutritive value of pasture under a system of frequent cutting resembling the conditions of close grazing. This investigation shows that when grass is kept short by grazing a high protein percentage is maintained throughout the whole season, and that, compared with grass allowed to grow until suitable for haymaking, although the hay crop yielded much more dry matter per acre, it only yielded about two thirds of the amount of digestible protein obtained in the herbage from the pasture plot. Still further, the fibre of the pasture grass was found to be much more digestible than the fibre of the hay crop, being digestible almost to the same extent as the carbohydrates. The pasture as treated favoured increased clover growth. It should also be mentioned that the soil in which the pasture was grown contained very satisfactory amounts of available phosphate and potash.

In this report it is mentioned that cutting the grass with motor mower and grazing, in certain respects, is not strictly comparable, as the mower is non-selective and animals show tendency to graze certain herbage and leave the rest to grow coarse.

The grass frequently cut as in this investigation was found to have a narrow nutritive ratio, and it is mentioned that if any supplementing is required when grass is fed in this manner, a carbohydrate and not protein concentrate should be used.

It is stated "that the results of the investigations are only applicable to such pastures as are kept short by being grazed to their fullest capacity."

The foregoing illustrations are sufficient to emphasize the fact that the protein content is higher in the younger stages of grass growth.

The Importance of Protein Content of Pastures.

In Australia the fact that young pasturage has higher protein content than that of matured growth has been to some extent recognised. It has been related that a dairy farmer has fenced off his grazing area in order that the herd might graze over one paddock one day per week. The animals under such practice should, according to the illustrations mentioned, obtain more protein than if grazed on more matured grass.

The importance and necessity of a sufficiency of mineral matter in the pastures and crops eaten by animals for their healthy growth has been mentioned, but the protein content of the feed is also of the very greatest importance. The animal requires adequate quantities of the various nutrients and accessories of a feed, but this paper is dealing only with the mineral and protein content of pasturage, and a close connection exists between these substances. Clovers and cultivated legumes are characterised by having a high protein and mineral content, the last containing a high percentage of both phosphorus and calcium, especially of calcium.

Phosphatic and Lime Deficiency in Soils.

As before mentioned, the soils of a large portion of our grazing areas are deficient in phosphates, and also it may be stated in some cases a deficiency in lime occurs. Therefore it naturally follows pastures growing in above-mentioned soils are deficient in legume growth, but where climatic conditions are favourable upon application of phosphatic fertilisers a good growth of clover has resulted.

It is known that by means of bacteria existing in nodules upon their roots the leguminous crops obtain their nitrogen from the air, and it is stated that leguminous growth in pasturage increases the nitrogen content of the other grasses of the pasturage.

Bear (9) writes—"As to whether any associated non-legumes are benefited by nitrogen fixed by the nodule organisms is uncertain. While the content of the nitrogen of the associated non-legume has been shown to be increased, this may be by reason of the favourable effect of the legume on nitrification."

Legumes in Pastures.

In connection with this matter Murray (10), in a paper, "Meadow and Pasture," gives a very interesting explanation of the beneficial results of legume growth in pasturage. In this article it is pointed that in the early stages of growth there is little difference in the nutritive value of the several varieties of grass, but towards maturity the digestibility of the organic matter is modified. Again, it is stated that heavy dressing of soluble nitrogenous fertilisers accelerate the formation of fibre and that phosphatic manures have a contrary effect; and experiments are quoted showing that the nutritive value of hay was depressed by the application of ammonium sulphate and that in other cases by the application of basic slag or superphosphate much more mutton was obtained from the land than where such applications were not made.

Mention is made of the acceptance of the idea that, owing to the accumulation of nitrogen in the soil by growth of clover, pastures were improved; then why should this clover-accumulated nitrogen, which it is believed must be transformed into nitrates before being utilised by other plants, be regarded as more beneficial or less harmful than nitrogen in the form of sulphate of ammonia—which in the above-mentioned experiment was not beneficial?

Murray explains this, writing as follows:—

"The key to the mystery appears to be that in pastures the clovers not only collect nitrogen, but they also regulate the supply. In a previous article (11) the author pointed out that both the quantitative and qualitative results depend not only upon the amounts, but also, to a very large extent, upon the relative proportions in which the various fertilising ingredients are present in the soil. At present only the nitrogen and phosphoric acid need be considered. Now, clovers require more phosphates than the grasses—about twice as much per acre—and any deficiency in this respect tells much more heavily against the former than against the latter, and the growth of clover is restricted. The supply of nitrogen does not

therefore increase beyond the amount of phosphates for which it is suitable. When the amount of available phosphoric acid in the soil is increased by application of phosphatic fertilisers, a marked increase in the amount of clover in the herbage almost invariably follows. The supply of nitrogen, which is necessary for the growth of grasses, is thus increased, but the quality of the fodder is not deteriorated, because the quantity of nitrogen accumulated in this way is never in excess of the amount of phosphate for which it is suitable."

Queensland Grasses.

From a review of a large number of analyses of Queensland grasses which have been published in the annual reports 1909, 1912, and 1914 of J. C. Brunnich, Agricultural Chemist, the great variation of the crude protein content of these grasses cut at different stages of their growth will be very noticeable. And when stock, through one cause or another, have nothing practically to eat but the matured low protein-content grass, which at this stage will also have a very low digestion coefficient, it will follow that through protein deficiency the growth and constitution of the stock will be seriously affected.

Brunnich (12) reports protein starvation as being one of the causes of death of sheep feeding upon Mitchell grass hay containing 2.01 per cent. crude protein.

Factors Requiring Urgent Consideration.

Judging then from what has been already stated in this paper and referring to stock feeding in Queensland, it would appear that mineral (phosphorus and calcium) and protein deficiency are two factors that require urgent consideration..

In the case of those stock feeders whose grazing areas are climatically suitable for a more or less continuous clover growth, the application of phosphatic fertilisers to the pasture would remedy both deficiencies.

Even when late and irregular rainfall causes a spasmodic clover growth, the nitrogen accumulated by this growth would, according to reference (10), be utilised by the non-leguminous growth. And where top dressing with phosphatic fertilisers of only restricted grazing area is considered profitable, any further requirement of mineral matter or protein must be supplied by phosphatic licks and feed stuffs with high protein content.

The unique position of clovers in the leguminous growth of pasturage is recognised, and so far they only have been mentioned, but in the greater porportion of the grazing areas of Queensland the climatic conditions are unsuitable for clover growth. It is thought therefore that there is a very large amount of investigational work to be done in connection with discovering, if possible, leguminous herbage, indigenous or imported, most suitable for the pasturage of each particular district. As before stated, the ash analyses of the legumes show that these plants require a plentiful supply of phosphorus and calcium for their growth, and it is not inferred that any legume is likely to be discovered that is exceptional in regard to the above-mentioned requirements.

As with other plants, the different legumes have root systems ranging from shallow to deep-rooted, and with the deep-rooted varieties, the roots having contact with a larger soil area, the possibility occurs of their being able to obtain more plant food than shallow-rooted varieties, and also of being more suitable to droughty conditions.

Central and Western Queensland Grazing Areas—Soil Analysis.

From analyses made in the Queensland Agricultural Chemical Laboratory of soils from the Central and Western grazing areas, it is seen that there is very marked deficiency in phosphorus combined with, as a general rule, good calcium and potash content. It is thought then one important factor causing the very high mortality in lambing, which has become more apparent in latter years, in certain grazing areas is the gradual depletion of available phosphates in the soils of these areas; the constitution of the ewes being weakened by an insufficient amount of mineral matter and protein in their feed.

The principal grass of the pasturage, owing to insufficient phosphorus, grows to maturity rapidly, and is therefore liable to contain a relatively low amount of digestible nutrients, as illustrated in (10).

Also, owing to the want of any soil plant food there is the probability of change in the botanical composition of the edible herbs and shrubs of a pasturage occurring, resulting in a less nutritive growth becoming established.

The Value of Suitable Stock Licks.

With stock grazing on such country the use of phosphatic licks, together with top dressing with phosphatic fertilisers (effecting an increased legume growth), at least some paddocks to be used for sick and stud stock, will undoubtedly improve the constitution of the stock, and lower the high mortality.

The gradual exhaustion of the soil phosphates may have caused the lowering of the legume content of the herbage, and when consideration is given to the fact that stock show instinctive preference in grazing legume growth, it is possible for such growth to have been entirely depleted, and in such cases, even with top dressing, it is thought quicker and more profitable results would be obtained by planting suitable legumes in the herbage.

In Queensland some stockowners have followed the recommendation of the Agricultural Chemist, J. C. Brunnich, and have supplied their stock with a lick composed mainly of Nauru phosphate with salt, and reports have been received stating the very beneficial results obtained by using such licks.

That recognition of the value of phosphatic licks is taking place is evidenced by the statement of one Brisbane firm that within the last fifteen months 460 tons of Nauru phosphate have been sold to stockowners for purposes of stock lick; also, prepared phosphatic licks are now upon the market.

It is to be hoped the demand for Nauru phosphate rock, both for fertiliser and lick purposes, will ultimately be large enough to allow the landing and grinding of this rock to be a commercial undertaking in Queensland, thus allowing the ground rock to be sold at a lower price.

Conclusion.

This paper has been concerned with only phosphate and protein deficiency in stock feed; that deficiency in other constituents of feed may cause serious trouble is recognised.

The very comprehensive programme of investigational work upon the subject of Animal Nutrition in the Commonwealth, as outlined by Professor T. Brailsford Robertson in "The Journal for Scientific and Industrial Research," vol. I., No. I., will yield, in its accomplishment, information of the greatest importance both to the investigator in animal nutrition and the stock feeder.

- (1) Theiler, Green, and du Toit, J. Dep. Agric., S. Africa, May, 1924.
- (2) Davis, Agric. J. of India, 22-77.
- (3) Armstrong, J. Agric. Sci., 7-283.
- (4) J. Agri. Sci., 16, Part 1.
- (5) Elliot and Crichton, J. Agric. Sci., 16-65.
- (6) Godden, J. Agric. Sci., 16-78.
- (7) Godden, J. Agric. Sci., 16-98.
- (8) Woodman, Blunt, and Stewart, J. Agric. Sci., 16-205 and 17-209.
- (9) Bear, Soil Management, 1924.
- (10) Murray, "Fertilisers and Feeding Stuffs Journal," vol. xi., 1926, p. 85.
- (11) Murray. "Fertilisers and Feeding Stuffs Journal, vol. ix., No. 21.
- (12) Brunnich, "Queensland Agric. Journal," March, 1926.

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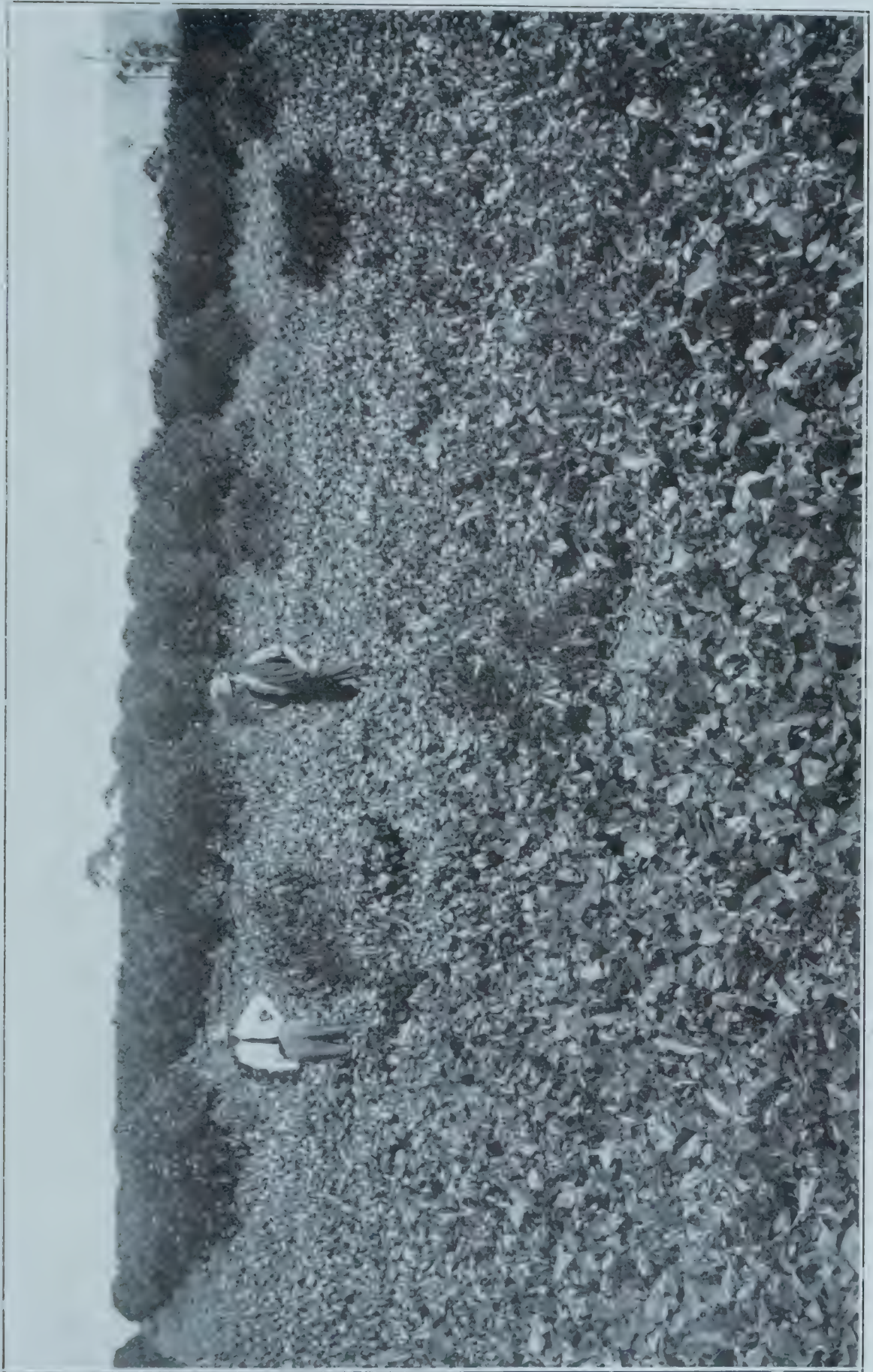


PLATE 7.—A GREEN MANURING CROP (COWPEA) AT PALMWOODS.

THE PRINCIPLES OF BEE-KEEPING.

FEEDING AND BREEDING FOR SPECIAL PURPOSES.

By RUPERT HOLMES, Poultry and Bee Instructor, Queensland Agricultural College, Gatton.

It is important that the beginner should clearly understand the principles underlying successful bee-keeping. A colony of bees consists of fertile queen, a large number of worker bees, and during summer a certain proportion of drones (males), together with their combs and brood. The strength of a healthy colony depends on the vigour and laying power of the queen, who is at her best in her second season. A queen hatched in October 1924, will be at her best in September 1925. She should be replaced by a young one in 1926 by requeening. Queens may either be purchased, or be raised by different methods, which will be described later. The economy of a hive depends on (1) the generation of sufficient warmth in the brood nest (by means of the heat from the bodies of the clustering bees) to such a point as will stimulate the production of eggs and enable the young

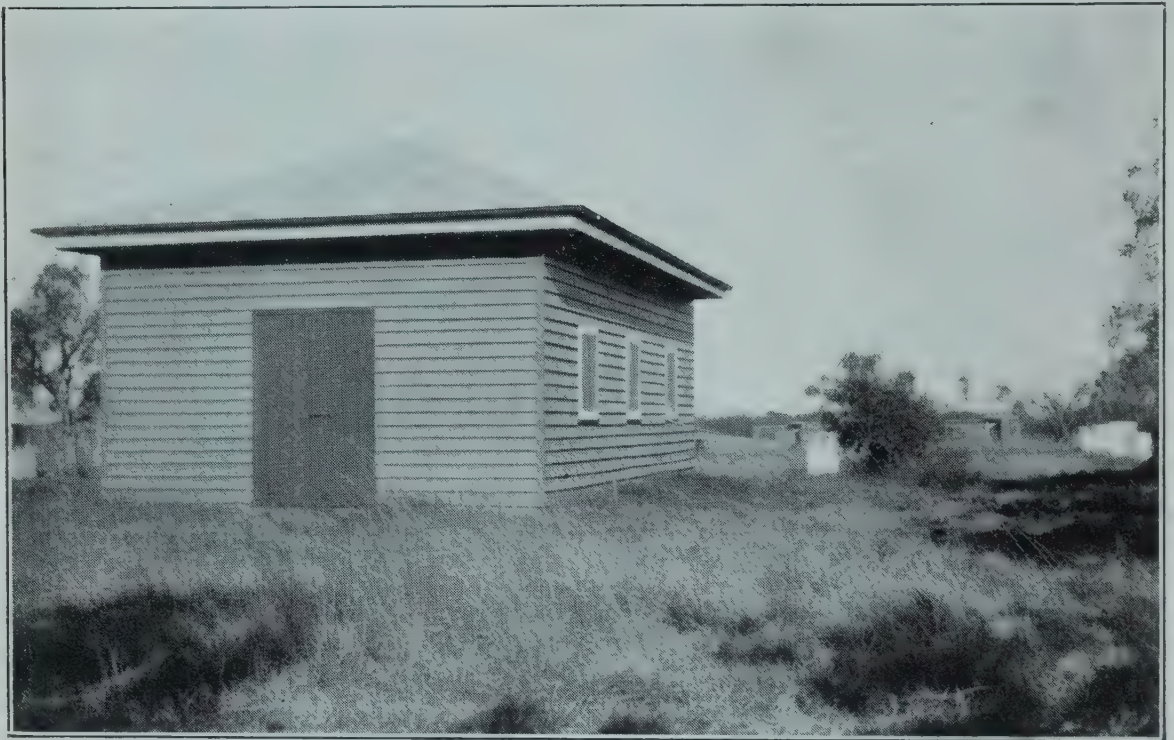


PLATE 8.—HONEY HOUSE, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

bees to be reared; (2) the nursing of the larvæ and the cleansing of the cells for the queen to lay in; (3) the collection of the pollen, water, and nectar for food; (4) the building of storage comb; and the collection of nectar for future supplies of honey. The first three of these conditions must be fulfilled before the last can begin; it is, therefore, only by means of a large and vigorous surplus population that a colony can gather enough stores for its future use, and provide surplus honey for the bee-keeper. The aim of the bee-keeper is to keep his colonies strong; weak colonies are always unprofitable.

Colonies for Wintering.

Many bee-keepers make the mistake of attempting to winter colonies by artificial increase. Colonies that for various reasons have become reduced in numbers are in such a weak condition that they often do not survive the cold weather, or the long confinement in the hive during the winter. In order to avoid failure increase should be made early in the season so that by the end of February at least four combs are filled with brood and well covered by bees. The colonies must then be built up during March and April until they are sufficiently strong to winter successfully. Colonies covering less than four combs at the end of February should be united to form stronger ones. After selecting two or more weak colonies for union move

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them gradually together. Allow them to remain two days in this position and then in the evening of the second day unite them in one hive.

This is carried out as follows:—First remove all combs in each colony which are not covered with bees. Then, after selecting and caging the better queen in the permanent hive remove the other queen or queens. The bee-covered combs are placed in this permanent hive. The empty hive or hives are then removed. The operation is completed by releasing the caged queen forty-eight hours after the colonies have been united. The process of building up is carried out by gradual addition of frames fitted with full sheets of foundation and in this way the strength of the colonies increases.

Feeding to Increase Brood Rearing.

In most districts few nectar yielding flowers are in bloom after March onward, and only a small quantity of natural food can, therefore, be collected by the bees. It is most necessary, therefore, in such districts, to supplement the natural food supply by feeding with syrup. This syrup must always be fed at this time of the year through a slow feeder, giving just sufficient for the purpose, otherwise, if a rapid feeder is used, the bees will store the surplus syrup in the cells. Syrup for feeding can be made from ordinary white cane sugar by dissolving each pound of sugar in half a pint of water by heating over the fire, in order to prevent robbing the entrance to the hives must not be wider than $\frac{1}{2}$ in. during the whole of the time feeding is taking place, and the syrup, which should be warmed, must be given late in the evening.

Feeding Candy.

If it is doubtful whether the supply of food contained in the combs is sufficient to carry the bees through to the following spring then feed candy. A cake of candy should be placed over the brood nest, and the candy supply should be renewed from time to time if required. Candy can be prepared as follows:—in a clean pan there should be placed three pounds of white sugar, half a pint of water, and as much cream of tartar as can be heaped on a sixpenny piece. The pan should be stood beside the fire, stirred occasionally until the sugar is dissolved, and then placed on the fire and stirred continually. When it has been boiling two minutes the pan should be removed and placed in cold water, until the sugar begins to cloud. The mixture should then be stirred well, and poured into saucers lined with paper and allowed to cool.

Pollen Substitutes.

This naturally brings us to a consideration of pollen shortages. Honey is the heat and energy forming portion of the bee's diet, and if in the protein footstuff pollen is missing or deficient, the young larvæ must suffer. Pollen under analysis contains ingredients similar to pea-flour. Bees, when pushed, will accept a number of substances such as flour (wheaten or rye) or oatmeal. A good plan is to place a number of flat trays containing flour about the apiary. The bees carry the flour to the hive. I have had success by mixing pea-meal with a pinch of salt, and working it into a thick paste with honey. The paste is plastered on to an empty comb, giving it directly to the brood nest. Most hives in winter have no brood or eggs, and this is to be preferred when no natural pollen is available in the late autumn.

Taking a normal season on early spring about the end of August, all colonies should be overhauled to see they are not short of food. Food in this case means honey and pollen. If there is a shortage I would suggest the pea-meal mixture with honey and salt worked into a stiff batter with 5 per cent. white of egg. Take a table knife and press the batter into an empty comb, which should then be given to the bees, on the outside of the brood nest.

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RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, 1928 IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY 1928 AND 1927 FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	May.	No. of Years' Records.	May, 1928.	May, 1927.		May.	No. of Years' Records.	May, 1928.	May, 1927.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
	In.		In.	In.		In.		In.	In.
Atherton	1·98	26	1·03	0·84	Nambour	5·02	31	2·97	0·06
Cairns	4·49	45	2·38	1·10	Nanango	1·55	45	0·94	0
Cardwell	3·57	55	1·74	0·26	Rockhampton ...	1·50	40	0·11	0·09
Cooktown	2·98	51	0·62	0·45	Woodford	2·95	40	2·57	0
Herberton	1·64	40	0·54	0·58					
Ingham	3·42	31	1·17	1·58	<i>Darling Downs.</i>				
Innisfail	12·34	46	9·07	9·82					
Mossman	3·69	14	1·37	1·12	Dalby	1·34	57	0·88	0
Townsville	1·33	56	0	0·03	Emu Vale	1·17	31	0·64	0
					Jimbour	1·23	39	1·43	0
<i>Central Coast.</i>					Miles	1·55	42	0·74	0
Ayr	1·13	40	0	0·03	Stanthorpe ...	1·91	54	1·38	0·14
Bowen	1·30	56	0·06	0·11	Toowoomba	2·22	55	1·79	0·08
Charters Towers ...	0·78	45	0	0	Warwick	1·57	62	0·95	0
Mackay	3·81	56	2·43	0·59					
Proserpine	4·63	24	1·23	0·48	<i>Maranoa.</i>				
St. Lawrence	1·80	56	0·19	0·08					
					Roma	1·48	53	0·40	0·06
<i>South Coast.</i>									
Biggenden	1·82	28	1·71	0·13	<i>State Farms, &c.</i>				
Bundaberg	2·76	44	0·86	0·18					
Brisbane	2·80	77	1·82	0·02	Bungeworgorai ...	0·59	12	0·42	0·04
Caboolture	2·92	40	1·67	0	Gatton College ...	1·70	27	1·36	0·03
Childers	2·25	32	0·98	0·10	Gindie	0·99	27	0	0
Crohamhurst	4·92	35	4·12	0·12	Hermitage	1·26	20	0·65	0
Esk	2·03	40	2·19	0·02	Kairi	1·99	12	1·52	...
Gayndah	1·57	56	0·09	0	Sugar Experiment Station, Mackay	3·44	29	2·03	1·13
Gympie	2·96	57	2·14	0·16	Warren	0·95	12	...	0
Kilkivan	1·89	48	0·82	0·11					
Maryborough	3·18	55	1·16	0·12					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for May this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,

Divisional Meteorologist.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

SHEEP IN THE WHEATGROWING PROGRAMME.

The value of fallowing is now recognised by all capable farmers. Fallowing, however, can only give the best returns when combined with sheep, and it actually provides the opportunity for keeping sheep. Where fallowing is not practised the straw is burnt off, and the land is ploughed for the succeeding crop; but under a fallowing system it is not necessary to burn the straw, for the stubble can be grazed with sheep six or seven months after harvest. A great deal of the straw is eaten and the balance is broken and trampled into the ground, and is generally put into such a state that it can be ploughed under easily without the texture of the land being interfered with.

In the old world great value is attached to farmyard manure, the basis of which is straw. It is not yet possible, in this country of high labour costs, to adopt reaping and threshing and the production of farmyard manure for the maintenance of soil fertility. The grazing of sheep on the straw and the ploughing under of the residues, however, is a very fair substitute, and has the advantage, which appeals to all of us, of being applicable at no outlay for labour. If, however, the crop is infected with disease such as flag smut, foot rot, or take-all, then the wisest plan is to burn the stubble early, cultivate the land, and sow an early crop of oats to provide feed.

A very undesirable feature of farming in our wheat districts is its one-crop nature. Such a system tends to deplete the fertility of the land and to encourage weeds and diseases. Some of these—wild oats among the weeds and take-all among the diseases—levy heavy toll upon our crops, and the only practicable method of dealing with them is by rotation. In practically all the wheat districts wheat is the only saleable crop which can be raised; but oats, barley, Sudan grass, and others can be grown as fodder crops and can be turned to account by means of sheep. By the use, therefore, of sheep, we can apply one of the great principles of good farming—rotation of crops.—“A. & P.” Notes, N.S.W., Dept. Ag.



PLATE 9.—CUTTING AND CARTING GREENSTUFF TO PIGS

This may be even a better proposition than grazing during very moist seasons when the ground is soft. There are occasions, too, when it pays better to cut and cart lucerne than to allow pigs to graze on the crop. This farmer is gathering the daily supply for his brood sows and young stock.

PIG FARMERS' SCHOOL AT GATTON.

A Comprehensive Programme.

Queensland's first pig farmers' school was held at the Queensland Agricultural High School and College at Gatton during the middle weeks of June. The school revealed a new phase of usefulness of the College and its excellent service to the rural industries of the State. It was the outcome of a suggestion by Mr. E. J. Shelton, Instructor in Pig Raising of the Department of Agriculture and Stock, and is the first school which has resulted from a full co-ordination between that branch of the service and the Department of Public Instruction. Professor J. K. Murray, Principal of the College, who also holds the Chair of Agriculture at the Queensland University, and Mr. Shelton organised the course on lines similar to the successful annual tractor and dairy schools conducted at the College. Lectures and practical demonstrations were given daily by members of the College staff and instructors of the Agricultural Department.

Farmers and farmers' sons from the South Coast, Darling Downs, and from the North beyond Mackay made up the personnel of the school. The enrolment was not quite as large as expected, but in the circumstances this was rather an advantage, for while the College is in ordinary session accommodation is limited. As it was classrooms had to be turned into temporary dormitories.

A Practical Programme.

Each forenoon was devoted to lectures for which there were three daily sessions, commencing at 8 a.m. The afternoons were taken up with practical demonstrations in the piggeries. Prior to the regular evening session a question period, from 7 p.m. to 7.45 p.m., was fixed. Inquiries into all phases of farm work were invited, and these were answered by the instructors. For the night gatherings a course of special lectures on general subjects was provided. During the currency of the school special visits to the bacon factories at Oxley (Foggitt, Jones, Limited) and Murarrie (Queensland Co-operative Bacon Company) were arranged, and this proved one of the most important and instructive features of the school. Every assistance and sympathy was forthcoming from the managements of the several bacon factories, from which samples of excellent foodstuffs were supplied to the school without charge. The benefit of bringing the farmers into closer contact with the factories and impressing them with their requirements, so that the work of developing the industry might be co-ordinated and continuous from breeding to ultimate market disposal of the product, was appreciated by all.

Visits to some of the larger piggeries near Brisbane were also arranged.

The Lecture Syllabus.

Lectures listed as follow were delivered in the course of the school:—

Breeding, Feeding, and the Characteristics of the several families of Pigs:
Mr. E. J. Shelton.

Principles of Feeding and Microbiology: Professor J. K. Murray.

Animal Husbandry: Mr. A. J. McKenzie.

Fodder Crops for Pigs: Professor J. K. Murray and Messrs. A. J. McKenzie and T. Graham.

Marketing Methods and Problems: Mr. J. A. Heading, Chairman of Directors, Queensland Co-operative Bacon Factory.

Pig Hygiene: Mr. H. G. Cheeseman, Department of Agriculture and Stock.

Pure Breeders' Societies: Mr. J. H. Whittaker, President of the Pure Breeders' Society.

Pig Club Organisation: Mr. A. G. Aitchison, Department of Public Instruction.

The Pig Industry: Mr. R. S. Maynard, Editor "Live Stock Bulletin."

Biology: Professor E. J. Goddard, Dean of Faculty of Agriculture, Queensland University.

Agricultural Education: Professor J. K. Murray.

The Value of Publicity to the Pig Industry: Mr. J. F. F. Reid, Editor of Publications, Department of Agriculture and Stock.

Overseas Experiences in the Bacon Trade: Mr. G. Setch.

Bacteriology: Mr. C. Pound, Government Bacteriologist.

Commercial Pig Farming: Messrs. R. G. Watson and C. H. Jamieson, and Staff Captain Alexander, of the Salvation Army Boys' Home, Riverview.

Show Preparation of Pigs: Mr. Howies, Royal National Agricultural Society.

Lectures on General Subjects: Mr. E. J. Dunlop, Department of Public Instruction.



PLATE 10.—FARMERS' PIG SCHOOL AT THE QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE, GATTON, JUNE, 1928.

FRONT ROW—*Left to Right*—Geo. Handley (Murphy's Creek), A "Riverview" Student, R. Johnston (Kingaroy), L. Skerman (Brisbane), Douglas Wells (Kureelpa), Noel Harding (Flaxton), Duncan Stevens (College), W. P. Hamon (College).

SECOND ROW—H. West (North Tambourine), Staff Captain Alexander ("Riverview"), H. J. McKenzie (College), Instructor Animal Husbandry, W. E. Muspratt (Littlemore, Boyne Valley), Ernest Baynes (Royal National), Professor J. K. Murray, J. P. Bottomley (Treasurer, Royal National), E. J. Shelton, J. Bain (Secretary, Royal National).

BACK ROW—C. Dunstan (Mount Sampson), L. A. Downey (Assistant Instructor), Captain Hunter ("Riverview"), P. N. Campbell (Lainington), H. Curtis (North Tambourine), Alf. Hanson (Jinghi Gully, Jandowae), M. Brosnan (Clifton), J. Stephens (Withcott, Toowoomba), T. Stephens (Withcott, Toowoomba), G. Hudson (Mackay), J. Schneider (Boonah), S. Whittaker (Casino, N.S.W.), W. Puschmann (Jandowae).

Field Demonstrations.

Practical field demonstrations in every phase of animal husbandry relating to pig raising were an important daily activity of the school, and in these the Principal, Professor Murray, Messrs. Shelton and McKenzie were assisted by Messrs. A. Severns and H. Noble of the College staff. The senior students of the College also attended all lectures and demonstrations.

The farmers attending the school elected a committee to assist in its management, consisting of Messrs. W. E. Muspratt, Boyne Valley (Chairman); M. J. Brosnan, Clifton; and A. A. Hanson, Jandowae. The spirit and camaraderie of the school was excellent, and speaking in appreciation of the course Mr. Muspratt said: "Most farmers are like us—they have pigs because they have cows, and they are working in the dark as far as the pigs are concerned. We want to know how to get something which will give us the quickest return and give what the bacon factories want, to get in the £ s. d. for our pigs. We consider ourselves very lucky to be able to get the chance this school gives us to learn what we need to know."

The school was run very inexpensively for the students. The total cost of board and tuition for the two weeks, exclusive of fares and the cost of the factory trips, was £2 13s. 6d.

CARE AND HANDLING OF PIGS.

A special notice, as set out hereunder, has been issued to pig farmers, carriers, loading agents, and officials:—

Queensland bacon-curers affirm that the pig farmers of this State suffer loss to the extent of thousands of pounds sterling annually through careless handling of live pigs in transit to market. This is the result of excessive bruising and damage, deaths in transit, &c.

Your attention is specially drawn to the following general recommendations:—

Remember that the great demand now is for prime light to medium weight fleshy bacon pigs.

See that your pigs are properly fed and "topped up" on grain food for several weeks before marketing.

Give your pigs ample exercise during the growing and "topping up" stages. Do not keep your pigs closely confined in small sties, as this is conducive to overfatness and to soft, flabby fat.

Allow your pigs clean drinking water at all times, and provide shade and protection from the effects of the weather.

Be careful to market at correct weight; you should weigh your pigs regularly and accustom them to being handled and driven. Ask your factory for their current schedule of weights and prices.

Avoid beating the pigs with whips, rods, or sticks; every time you strike them you inflict a bruise which reduces the animals' value.

Do not feed your pigs on the morning of despatch (they travel better on an empty stomach), but provide plenty of clean water.

Co-operate with your neighbours in arranging assistance at sale and trucking time.

Firebrand your pigs with your registered firebrand. Ear marks and ear tags have not proved satisfactory; the factories prefer firebranding.

Be certain that the factory receives early advice *re* your consignment, the numbers, grade, brand, mark, and time and date loaded. Hand a written statement to the buyer or official loading agent.

Co-operate with the Railway Department and the factories in their endeavours to deliver your pigs at destination in the best condition possible.

Use purebred boars only and sows of the best breeding you can obtain in producing your pigs, and buy store pigs only from reliable sources.

Help us to help you succeed in the industry.

Write to the Department of Agriculture and Stock, Brisbane, for all available information on the subject of pig-raising.

Issued under the authority of the Department of Agriculture and Stock, Brisbane, Queensland, 1928.

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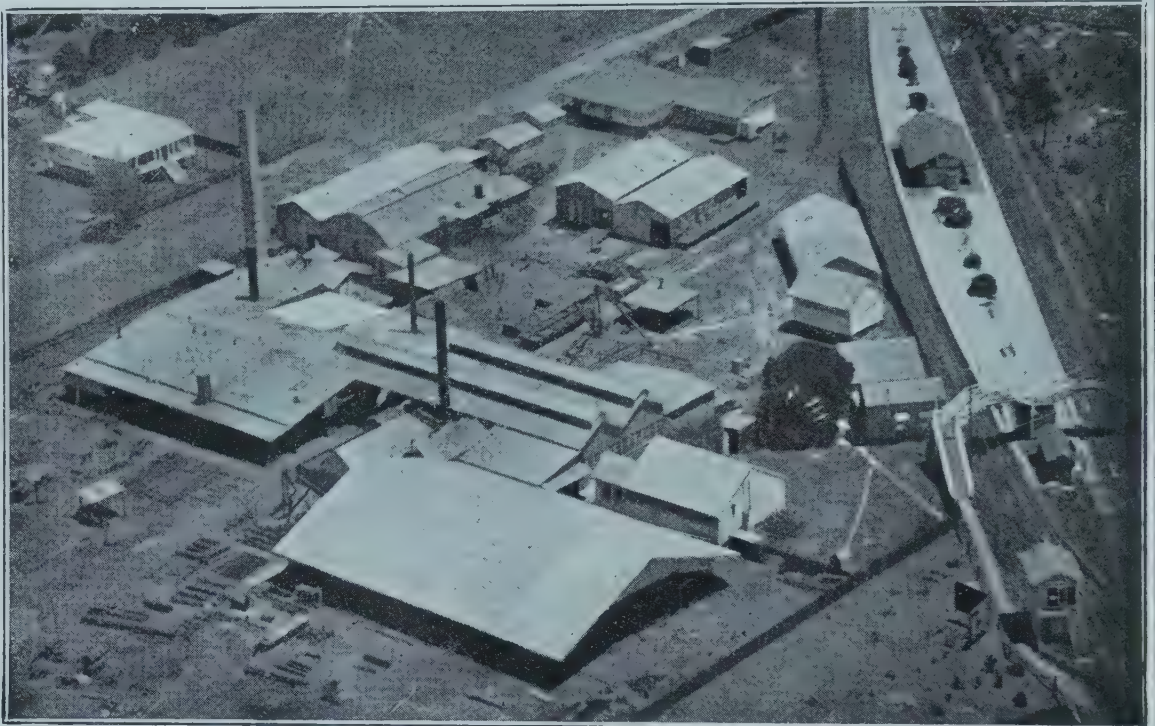
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PIG HYGIENE.

By H. G. CHEESEMAM, Senior Slaughtering Inspector.

From a paper read before the Pig Raisers' School at the Queensland Agricultural College, Gatton, on 15th June, 1928.

I might state that when my esteemed and enthusiastic friend, Mr. Shelton, invited me to assist in filling part of this programme by reading a paper before you, I really accepted the invitation reluctantly, realising that I had nothing very new or valuable to impart. Therefore, permit me to say if I can cause someone to reflect and put into practice the things which we already know, my effort will not be in vain.

Close association with meat inspection and piggeries for the past thirty years enables me to speak with some knowledge of the life and habit of the short-lived pig from its birth to its appearance on the table in various food forms. As we have all been taught, the pig belongs to the order mammalia, species pachydermata, or otherwise thick-skinned animal. Briefly, the generic characters of the domesticated animal are small head, ears short, thin, and sharp, neck full and broad, cheek full, flexible and short snout flattened in front, small and quick eyes, mouth small, strongly built body, uniform in line carrying a wealth of condition, short twisted tail well set, four toed, short legged, and full ham.

The wild pig has different characteristics, namely, long legs, long neck and snout, long narrow roach back, thin hams, carcass generally spare of flesh, eats ravenously, and develops big belly and lives on carrion offal.

According to design and nature the dentition of the pig varies considerably; at nine months he shows 40 teeth, and at eighteen months a full mouth of 44. In order, the teeth are divided into incisors or nippers, canine or eye-teeth, molars or grinders. Therefore, from the number and position of the teeth, physiologists are enabled to define their nature and functions, as they are always intimately related to the food and habit of the animal. They form, for the same reason, important guides to the naturalist in classification of animals. Thus the domestic pig can be classed as much a grinder as a biter, for he can as well live on vegetable as animal food, although a mixture of both is economically sound, which has been decided as the most natural.

From this description the pig may be regarded as a link between the herbivorous and carnivorous tribe, and is consequently known as an omnivorous quadruped; or, in other words, an animal capable of converting any kind of foodstuff into nutriment.

Characteristics of the Pig.

Physiologists and naturalists are all agreed that the functional characteristics of the pig are the same in whatever part of the world he may be found—he is known for his gluttony and indifference to the character and quality of his food. Occasionally he shows an epicure's relish for a succulent root, pumpkin, or other vegetable. He will the next moment turn with equal gusto to some unsavory offal, sour swill, or even liquid and stagnant filth from wallow holes in and about his lair, or in other words, will endeavour to convert any kind of aliment, good or bad, into supposed nutriment. Hence, from his coarse and repulsive mode of feeding, slothful habits, laziness and indulgence in sleep, he has gained for himself the unenviable name of being an unclean animal. The question arises "why?" Well, the answer is simply because the unfortunate animal is the victim of circumstances, brought about by the indifference of his keeper. Consequently, it is only reasonable to suppose that under such influence he is particularly susceptible to disease, saying nothing of other ailments of a dietetic nature, and which set up derangement of the alimentary canal.

Now, as filth defiles physically the characteristics of the flesh or meat, it behoves those whose livelihood it is to depend upon pig-raising to consider the seriousness of violating the law of nature, for it rests with man to counteract the evil consequences of some of his habits which the animal is unable to teach himself.

It is a remarkable fact that, though everyone who keeps a pig knows how prone he is to disease or other ailment which injures the quality and wholesomeness of the meat or flesh, yet very few have judgment to act on what they see and provide against it by strict attention to his diet, housing, and general welfare.

By strict attention to diet particularly is meant the thorough cooking or sterilising of all flesh food such as offals from slaughter-houses, skimmed and separated milk from dairies, butter and cheese factories, scraps of cooked animal substances, and boiled vegetables, bread and other aliment cast from banquets and possibly plates of sick and ailing individuals. The lastmentioned is most necessary and the old adage "Prevention is better than cure" always stands good, for it is known, for instance, that the pig is most susceptible to tuberculosis. We also know that there are many individuals in our midst suffering from that dread disease, and experimentalists have shown the possibility of infection from human beings. In nearly every case the pig is infected by ingestion, thus it will be seen how easily he might become infected if care is not exercised in the systematic selection and proper boiling of all foodstuff.

Tuberculosis in Pigs.

It is quite common knowledge that tuberculosis in the pig develops rapidly without showing any external symptoms. The disease can only be definitely detected upon slaughter. Anyway the disease is always the same from whatever cause. Though subject to disease, no domestic animal is more easily kept in health, cleanliness, and comfort. By comfort is meant that his sleeping quarters should be perfectly dry and well sheltered from all changes of the weather. He should have a nice cosy bed to burrow in; moreover, under cover in his sty, there should always be a trough full of clean drinking water. The trough should be so arranged as to prevent the animal from immersing his body or standing in it, or otherwise fouling it. Clean water is most essential to a pig, saying nothing of a shovelful or two of charecoal, some lime, brimstone, Epsom salts or other medicinal agent, which are necessary to correct physical disorders caused by his artificial existence.

The Pig's Economic Value.

As you all must know, habit blunts the sensibilities of most of us; and men are not naturally cruel. Still, I am a believer that there are some among us who never realise the fact that the brute beast can be made to suffer quite unnecessarily. What would happen if a pig had a voice to tell its sufferings and needs? I am afraid that many of us could not listen without feeling a twinge of conscience.

There is no domestic animal so profitable or so useful to mankind as the pig. Its value per pound exceeds that of all other flesh-giving animals.

Meat Inspection.

Meat inspection is of great national importance to a meat-eating community such as we are in Australia, especially as our daily bill-of-fare is made up largely from the flesh of the ox, sheep, or pig. Therefore, it is only reasonable to expect that the great mass of consumers—the general public, for they are the most interested in the matter—should have some sort of guarantee that the flesh they do eat is perfectly free from disease.

Meat eating people throughout the whole world recognise the necessity and importance of inspection of their meat and other food products.

Diseases of the Pig.

Tuberculosis is commonly spoken of as "T.B.," technically it means "Tubercle Bacilli." We are told that tuberculosis is a specific bacterial disease, and above all the most widely distributed of all contagious diseases, saying nothing of its being the most universally dangerous and deadly to man and animal. Of the latter, swine, according to statistics, are first among its victims.

Speaking generally, I have endeavoured to show how easily a pig might become tuberculous when fed on material rich in tubercle bacilli. Apart from such mechanism of infection, a tuberculous sow may infect all its young when its teats are contaminated or otherwise infiltrated by tuberculous deposits. We are also told that infection by the respiratory tract is certainly possible, but rare owing to the

fact that affected animals are usually slaughtered before the softening of the pulmonary lesions have time to disseminate the virulent matter.

The disease can only be definitely detected upon slaughter, that being so, the inspector has no difficulty in locating the presence of the disease, that is, as far as the naked eye is concerned.

More often the glands of the head are affected than the body, which accounts for the greater number condemned. Times out of number the question is raised, "Why condemn the head and not the body?" It may be explained this way. The pig mainly breathes through his mouth where straying germs of disease gain an entrance which are absorbed by the delicate membranes of the mouth, tongue, and tonsils, resulting in the fact that the glands draining the part act as fortresses against further invasion of the body. It then only remains a matter of time when they may be overcome by the enemy, thus the barrier being broken down the germ has a clear passage along the ducts into the next lymphatic vessels. It therefore will be understood that if only a speck of disease is found elsewhere in the carcass, it involves seizure of the whole body.

Often a recommendation of the Royal Commission on Tuberculosis in 1898 is cited, which reads: "In view of the greater tendency to generalisation of tuberculosis in the pig, we consider that the presence of tubercular deposits in any degree should involve seizure of the whole carcass and of organs."

This rule, of course, is not carried out in the case where the head is only affected.

Another feature of the disease, from an inspection point of view, lies in the fact that it is seldom met with in the flesh or bones of the pig, mainly confining itself to the lymphatics and delicate linings of the chest and abdominal cavity and organs. The glands, or kernels as they are commonly called, play an important part in meat inspection. It is from them the inspector gets the first indication of the presence of disease. The normal condition and colour of a gland is moderately small, somewhat firm, and on cutting exudes moisture (lymph) the colour of—in fact it resembles—common yellow soap.

The most accessible glands are the sub-maxillary and cervicals of the head and neck, dorsal (back), renal (loin), inguinal or mammary, and the iliac. Of the visceral glandular organs lungs, liver, and mesentery, &c., are all more or less subject to disease.

With regard to condemnation for parasitical infestations, very rarely is a pig totally condemned. The only parasite of any consequence is the kidney worm known as the "*Stephanurus dentatus*." Very little is known about it other than it is very destructive and will sooner or later cause economic losses if the pig farmer does not attend strictly to the laws of sanitation.

The worm itself varies in size, being a thick, round, and mottled specimen and is found abundantly in the kidney region and in other portions of the body. The presence of the worm gives rise to cysts and abscess formation containing pus-producing organisms and eggs of the parasite. They are also found in the ureter; from whence they pass out with the urine. Old sows and boars are very subject to the parasite, and no doubt are the cause of all the trouble in younger pigs. Pigs during life show no evidence of the infestation, unless they are old sows. From my experience the complaint is more pronounced in cold weather than hot.

The conditions which are most favourable for the infestation of the kidney worm are filthy wallows, insanitary feeding and watering places, especially where large numbers of pigs are kept year after year on a small area. Veterinarians tell us there is no reliable method of dealing with the trouble other than thorough sanitation. That being so, the pig farmer must then seriously consider the matter of changing his sties and yards every year or so to fresh ground, and planting a crop before using the piggery again for pigs. In any case, pig yards should be selected with a view to securing proper drainage, cleanliness, and sanitation. They must also be as free as possible from the common type of mud wallow, which soon becomes a reservoir of concentrated filth and bacteria.

In conclusion, I would plead for the pig's welfare and comfort, and again stress the fact that much disease and other disorders are due to insanitary feeding and unclean drinking troughs in which the pigs are able to place their feet which carry filth direct from the floor of the sty.

Answers to Correspondents.

Seaweed as Fertiliser.

A.G.B. (Townsville)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

Seaweeds contain from three-tenths to 1 per cent. of nitrogen, one-tenth to $\frac{1}{2}$ per cent. of phosphoric acid, and $\frac{1}{2}$ to 2 per cent. of potash. When burnt the nitrogen is lost.

Charcoal has practically no manurial value, but will sweeten the soil.

Coral sand is practically pure lime carbonate and contains only a small trace of phosphoric acid.

Sawdust contains from $\frac{1}{2}$ to 1 per cent. of nitrogen, practically no phosphoric acid, and one-tenth per cent. of potash and a little lime.

Fish manure contains from 3 to 5 per cent. of nitrogen, and from 3 to 8 per cent. of phosphoric acid, and is a valuable fertiliser.

FRUIT CULTURE.

Selected from the outgoing mail of the Director of Fruit Culture, Mr. Geo. Williams:—

Papaw—Sex Determination.

C.P. (Eel Creek)—

There is no reasonably certain method of distinguishing the male from the female papaw. It is found, however, that the most vigorous seedling plants are generally males, and should be discarded in favour of those of weaker growth.

BOTANY.

Selected from the outward correspondence of the Government Botanist, Mr. C. T. White, F.L.S.

Phasemy Bean.

J.G. (Boonah)—

The specimen is *Phaseolus semierectus*—the Phasemy Bean, a native of tropical America now widely distributed over the warmer regions of the globe. It was introduced into Queensland many years ago as a fodder, but never took on and is now only to be seen as a stray along railway lines, &c.

Kapoc.

J.C.H. (Port Glasgow, Papua)—

We have little experience with Kapoc here as it is only grown as an ornamental tree or as a specimen tree in public gardens. Some few years ago, in response to several inquiries, we compiled and published some information on it. A copy of the "Journal" containing that matter has been forwarded.

A Native Fig (*Ficus fasciculata*).

W.H.C. (Malanda, N.Q.)—

The fig is *Ficus fasciculata*, a native fig nowhere abundant, but found here and there on the Atherton Tableland, Eungella Range, and on one or two other places in North Queensland. There is a large number of figs in the scrubs of Queensland—about sixty different sorts—and this seems the best of the lot as an edible fig, in fact, the only really palatable one. We have never heard a common name for it, but if you wanted to give it one you might call it the "Brown Fig," from its character of turning brown when ripe. It should strike quite well from cuttings or could be grown from seeds, but its value would only be, we think, as a "private garden" tree; the fruits bruise very easily and quickly rot.

“Wild Onion.”

Enquirer (Toowoomba)—

The specimen is *Bulbine bulbosa*, commonly known as Wild Onion. It occurs in all the States except Western Australia, and is generally regarded as poisonous, though no definite feeding tests have been carried out with it. The symptoms of poisoning by it are given as severe scouring, with great pain and a mucous discharge of a green and yellowish colour from the nose.

Carbide Residue.

K.G.C. (Westwood)—

Your inquiry regarding the use of carbide from gas plants was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises as follows:—“Carbide residue is pure slaked lime, and can be used in place of agricultural lime. It is best to allow the residue to dry and break up to coarse powder before applying to land.”

Plants from the Central District.

G.W.K. (Sapphire)—

1. *Solanum ellipticum*.—A “Potato Bush.”
2. *Pterocaulon cylindrostachyum*.—A common weed: the only local name I have heard is “Rog Weed,” a name applied in Queensland to several plants.
3. *Chenopodium carinatum*.—A common plant in Queensland, especially in light soils along watercourses, &c. I have never heard a common name.
4. *Trianthema crystallina*.—A common plant, but I have not heard a common name for it.
5. *Abutilon* sp.—Belongs to a genus that contains several garden shrubs known as “Chinese Lantern” flowers.
6. *Sida subspicata*.—Belongs to the same genus as the common *Sida retusa* or “Paddy’s Lucerne.”
7. *Epaltes australis*.
8. *Rhagodia*.—This and an allied plant are known in Queensland as “Fish Weeds.” They are valuable fodders, but are said to give a fishy flavour to the milk of cows feeding on them.
9. *Polanisia viscosa*.—Sometimes called “Wild Mustard.” The plant has a wide distribution through Queensland to India.
10. *Amarantus viridis*.—Green Amaranth. The young tops can be used as a substitute for spinach.
11. *Nyssanthus erecta*.—“Needle Bush.”
12. *Achyranthes aspera*.—“Needle Burr.”
13. *Sida corrugata*.—See note under No. 6.
14. *Abutilon oxycarpum*.—See note under No. 5.
15. *Sida corrugata*, var. *ovata*.—See note under No. 6.
16. Too fragmentary for determination.
17. *Alternanthera nana*.—A weed of the Amaranth family; useful forage.
18. *Justicia procumbens*.—Small herb eaten by stock.
19. *Hibiscus Sturtii*.
20. *Ruellia australis*.—A small herb, eaten by stock.
21. *Euphorbia pilulifera*.—Asthma Plant. The dried leaves taken as tea afford some relief in asthma for a time, but the effects are said to wear off after repeatedly taking the infusion.

Swamp Paspalum.

W.D.D. (Innisfail, N.Q.)—

The grass is *Paspalum scrobiculatum*, the Ditch Millet or Swamp Paspalum. It is a fairly common grass in Coastal Queensland and grows mostly in wet, swampy places and in such places has some value as growing where other grasses do not do much good. Apart from this, it has no particular value.

“Giant Couch” or Para Grass.

M.K. (Dalby)—

The grass commonly known in Queensland as Giant Couch is *Panicum muticum*, a tropical grass known outside of Australia mostly as “Para Grass.” It is unquestionably a valuable forage, particularly for places along the coast from Rockhampton northwards, and is one of the principal grasses of the Atherton Tableland. We would say, however, it was quite unsuitable for the Dalby district.

“Love Grass” (*Eragrostis curvula*).

L.M. (Ballandean)—

Your specimen has proved to be one of the American species of *Eragrostis* or Love Grasses naturalised in New South Wales. Mr. Whittet informs us it is *Eragrostis curvula*. He says:—“We are growing this grass in our 18-inches rainfall district; it is somewhat harsh but very drought-resistant.” E. Breakwell, in his work “The Grasses and Fodder Plants of New South Wales,” says:—

“This grass was introduced from America some years ago, and grown at the different experiment farms. It soon asserted itself as a very rapid grower, a free seeder, extremely drought-resistant, but with leaves of a rather harsh character. The leaves are extremely long, tapering very gradually to a fine point. During a dry spell the ends of the leaf wilt and curl up, leaving the rest quite green. The inflorescence is always of a distinct leaden colour, with the spikelets crowded and rather pointed.

“*Eragrostis curvula* does extremely well under cultivation, and has produced yields at Hawkesbury Agricultural College as high as 6 tons of green feed per acre. Owing to its drought resistance it was taken up by different farmers, and although it has been reported on favourably, both for drought resistance and for palatability, it does not seem to have taken on to any extent. Farmers at Taylor’s Arm, Nambucca River, have found it an extremely useful grass for spreading over hillsides of poor country, and testify that cattle eat it very rapidly when it is young.

“Although *Eragrostis curvula* is looked on as a permanent grass, it seems to die out after a few years if subjected to hard conditions. New seedlings, however, are constantly appearing, and it could undoubtedly be maintained in a permanent pasture by allowing it to seed. Generally speaking, this grass may be recommended for scattering over burnt ashes in scrub country of poor formation, when it will act as a good stand-by in times of drought.”

In general appearance it reminds one of the common Tussock Grass of New Zealand, but the structure of the seed head is quite different.

“Cherry Penda.”

J.L.T. (Atherton)—

We do not know the species by its common name. It is evidently a species of *Eugenia*, but which one we cannot say from the fruit alone. We have handed the seeds to Mr. Bick, Curator of the Botanic Gardens, for propagation. He is in charge of the Sherwood Arboretum, which is under control of the Brisbane City Council as part of its park system.

A Northern Species of *Zamia*.

E.H.H. (Kureen, via Cairns)—

The specimen is *Bowenia spectabilis*, a species of “*Zamia*” or “Cycad,” common in North Queensland. Like the rest of the family, it has been accused of causing “rickets” in stock. No feeding experiments have been carried out with it, but the general symptoms as observed in “*Zamia*” poisoning are very different from those you describe. The poison is a cumulative one, and the progress of the disease gradual. Attention is first directed to the presence of the disease by a peculiar arching of the back and weakness in the hindquarters. When approached, affected animals become excited and endeavour to get away, but as soon as they get into a fast walk the hindquarters sway from side to side, though in the worst cases an animal cannot go a few yards without falling down and is unable to rise without assistance.

Needle Burr.

J.T. (Kaban)—

The specimen is the Needle Burr (*Amarantus spinosus*), a common weed on the Atherton Tableland. It is rather a bad weed pest, but is not poisonous in any way. Apart from its spines it is quite edible, and the young shoots of it and allied species are used in India and other Eastern countries as greens.

A Poisonous Lily (*Dianella laevis*).

F.W.N. (Birkdale)—

The specimen is *Dianella laevis*, a plant of the Lily family, fairly common in Queensland, but for which I have not heard a local name. It has been recorded as poisonous both here and in New South Wales. No definite feeding experiments have been carried out with it, but as other members of the genus abroad are recorded as poisonous, the plant should be cut out from paddocks to which stock have access.

A Poisonous Plant (*Datura stramonium*).

“QUERIST” (Townsville)—

The cases of stock poisoning by *Datura stramonium* that have come under our notice have been confined to cases where the plant has been found as an impurity in chaff. It is fairly common in cultivations, and disastrous losses have occurred through stock eating chaff containing *Datura*. All parts of the plant are poisonous, but the growing plant is rarely touched by stock as it has a nauseous taste and odour. One case is, however, recorded by Bailey and Gordon (“Plants Poisonous and Injurious to Stock,” page 55). The commonest *Datura* on the Central-West and Northern Downs is *D. Leichhardtii*, a native species which is very abundant on the black soil plains. This has been suspected of poisoning stock at times, though it must be only very rarely eaten. No work has been done on it, but as all the genus are poisonous, it is not likely to prove an exception. An article on the genus was published in this “Journal” for July, 1917.

“Tick Trefoil”—Carpet Couch.

W.E.P. (Maroochydown)—

The “clover” or “trefoil” is *Desmodium triflorum*, a species of “Tick Trefoil.” The local name is given to it on account of the pods breaking up into small one-seeded pieces which stick to clothing, and around the feet of horses and cattle. It is quite a useful fodder. The grass is *Paspalum platycaule*—Carpet Grass or Carpet Couch. A useful grass for growing where the better-known grasses, such as ordinary *Paspalum dilatatum* and Rhodes, do not succeed.

It is very hard to get grass established in Wallum and Honeysuckle country. You might try transplanting roots of the species—small rooting pieces like that you sent put in and lightly buried in showery weather or when the soil is damp should thrive readily enough. A mixture of ordinary Couch and *Paspalum compressum* (or *Axonopus compressus*) might be tried. Rhodes might do in the better patches.

Some annual trefoils, such as the Medick Burr (*Medicago denticulata*), might do, but seed is unfortunately not generally stocked by seedsmen.

Castor Oil Plant.

G.C.B. (Wallumbilla)—

The specimen is a variety of the common Castor Oil (*Ricinus communis*). It was very mouldy when it reached us, but seems the form with large red seed pods that is naturalised in some parts of Queensland. The seeds are poisonous, due to the presence of “ricin,” a very poisonous toxin. It is to this and not to the oil, which is a safe purgative, that the poisonous properties of the beans are due. In the extraction of the oil the poisonous principle is left in the residue, which makes it unsafe for the manufacture of cattle-cakes. The symptoms of poisoning are vomiting, gastric pain, diarrhoea, and dullness of vision.

Shade Trees Suitable for the Helidon Area.

“Inquirer” (Helidon)—

Following is a selection of shade trees suitable for Helidon. The list could, no doubt, be extended, but we have confined it to species more or less readily obtainable:—

Magnolia grandiflora.

Flacourtia cataphracta. Cataphracta Plum—edible fruit.

Pittosporum undulatum.

Lagunaria Patersoni. Pyramid Tree.

Sterculia trichosiphon. Broad-leaved Bottle Tree.

Calodendron capense. Cape Chesnut.

Flindersia australis. Crow's Ash. One of the best shade trees, we should say, for your locality.

Nephelium tomentosum.

Harpullia pendula. Tulip Tree.

Schinus teretinthifolius. Broad-leaved Pepper Tree.

Harpephyllum caffrum. Kaffir Plum.

Ceratonia siliqua. Carob Bean.

Gleditschia triacanthus. Honey Locust.

Ligustrum lucidum. Privet.

Jacaranda mimosæfolia.

Grevillea robusta. Silky Oak.

Stenocarpus salignus. Wheel of Fire.

Celtis australis.

Celtis sinensis.

(Both species of *Celtis* are deciduous and called Portuguese Elm. They would do well with you, and the foliage has some value as a stock food.)

Ficus platypoda. Small-leaved Moreton Bay Fig.

Ficus macrophylla. Common Moreton Bay Fig.

Platanus occidentalis. Plane Tree.

Pinus longifolia. Chir Pine.

Araucaria Cunninghamii. Hoop Pine.

Araucaria Bidwilli. Bunya Pine.

Washingtonia filifera. Cotton Plant.

Saltbush.

F.L.P. (Brixton, Central Queensland)—

Reference your two specimens of saltbush—The one with smaller fruits (“seeds”) is *Atriplex Muelleri*—perhaps the commonest saltbush in Western Queensland. The one with larger, spongy fruits is not a freak but a distinct species—*Atriplex halimoides*. It is fairly common in some places, particularly in the south-western parts of the State. It is very common about Quilpie and westward to Windorah. We have also received specimens from the neighbourhood of Longreach, but we do not know if it is common there.

Plants Identified.

“INQUIRER” (Townsville)—

1. *Corchorus hygrophilus*. A fairly common plant in the Gilliatt country, but for which I have not heard a common name. It is not poisonous or harmful in any way.
2. *Euphorbia eremophila*. Caustic Plant. This occurs in all the mainland States, both on the coast and inland. It is generally regarded as very poisonous, and as it belongs to a dangerous group the suspicion attaching to it is probably based on fact. No feeding experiments, so far as I know, have been carried out with it.

The smaller plants contained in the same bundle belong to *Andraeane Decaisnei*—a very common plant over the Central and Northern downs. It is not known to be poisonous in any way.

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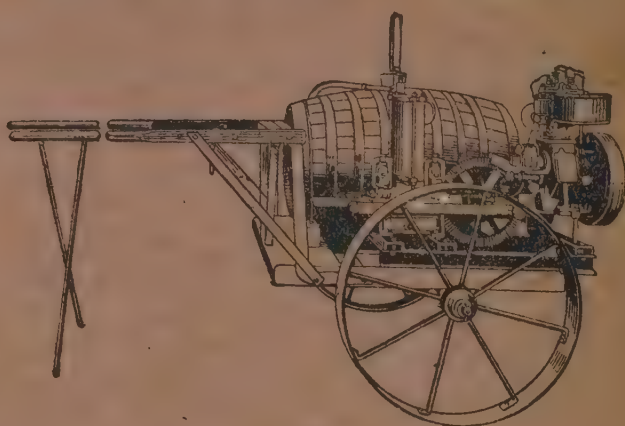
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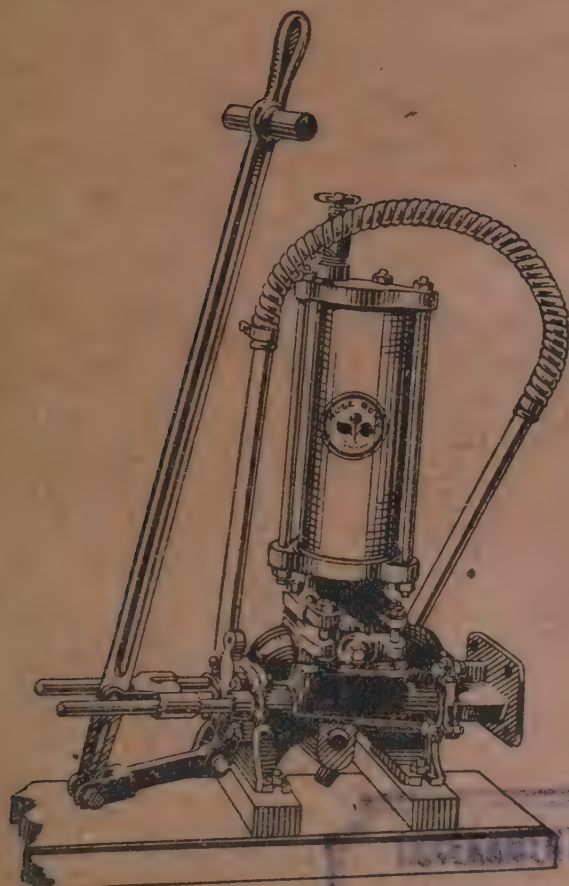
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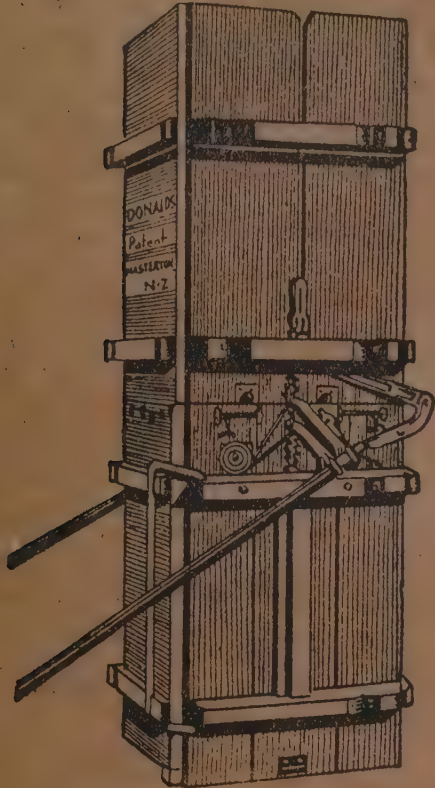
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Bacon Association Limited**
Murarrie, near Brisbane

The Peanut.

S.F.R. (Kawl Kawl)—

In reply to your queries regarding the Peanut:—

Botanical Name.—*Arachis hypogæa*. Family, Leguminosæ.*Country of Origin.*—South America (Brazil and Peru).

When Introduced into Civilisation.—A great deal has been written about this, but De Candolle, in his "Origin of Cultivated Plants," says he is inclined to the belief that the first slave ship carried it from Brazil to Guinea, and the Portuguese from Brazil into the Islands to the south of Asia in the end of the fifteenth century. It has been variously stated to have originally been a native of Tropical Africa, China, &c., but the foregoing are the now generally accepted facts.

Principal Kinds.—Six other species of *Arachis* are known from Brazil, but only *Arachis hypogæa* is the one in cultivation. The United States is one of the biggest growers of peanuts, and about ten varieties are generally recognised:—Virginia Runner, Virginia Bunch, Spanish, Small Spanish, Improved Spanish, North Carolina, African, Valencia, Tennessee Red, Georgia Red.

In addition to the above one often sees a particularly large one, two or three times the size of the ordinary peanut, and known as "Chinese Giant." It was imported by and grown at the State Nursery, Kamerunga, but for some reason or other it never took on.

PIG RAISING.

Selected from the outward mail of the Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.

Impaction in Pigs.

T.G. (Laidley)—

In our opinion the pig referred to died of constipation. This trouble affects pigs of all ages, and is especially severe on breeding sows approaching the farrowing stage. In fact, many sows die each year as a result of bowel troubles, others have trouble in farrowing, while others develop milk fever and similar ailments, which usually terminate in the loss of milk and the death of the young pigs. We recently investigated a case at Kingaroy, in which a farmer there lost several good quality pigs approaching bacon age. He was of opinion that the pigs had swine fever or some such disease, but was quite convinced it was constipation when a search of the yards in which the pigs were kept resulted in but a few small pebbles of hard, dry dung being found, with no indication at all that the pigs had any motion of the bowels for several days and were evidently in great pain, straining and endeavouring to rid themselves of dry, fibrous dung, the accumulation of many days.

Most pigs are subject to intestinal parasites at one or other stage of their existence, and the fact that you found one large, round white worm in the pig that died would not indicate any serious trouble. If you had collected fifty such worms, then you would have been justified in blaming these parasites for the mortality.

In cases of severe constipation, the most effective remedy is the enema. Enemas of warm, soapy water to which has been added one tablespoonful of olive oil or glycerine, are helpful in relieving the bowels. Follow this up with a dose of two packets of Epsom salts dissolved in half a pint of warm water and given as a drench, compelling the animal to take liberal exercise about three hours after dosing. Complete change of food is then advised. For the pigs not yet suffering, reduce the amount of corn and sweet potato vines and feed on skim milk, pumpkins, and green lucerne, compelling them also to take regular exercise in a good roomy pig run. There should be no need for medicine if pigs are kept in good sized runs and are given liberal supplies of green lucerne, &c. Sweet potato vines are not poisonous, but pigs consuming too many vines are liable to suffer from serious digestive disorders.

Preparing Pigs for Show.

W.V. (Boonah)—

The preparation of pigs for exhibition is largely a matter of care and attention in feeding and handling, having due regard to the classes in which the animals are to be exhibited. Size and condition count for much in classes in which age is a condition of entry. That is to say, a pig entered in a class for boar or sow twelve months and under needs to be as near to twelve months old as is possible. A pig three months old or thereabouts in a twelve months old class stands a very poor chance. Colour markings and breed characteristics vary with the different breeds. Keeping the skin and hair in good condition by frequent oiling either with petroleum jelly, coconut oil, or some other preparation, also counts for a great deal, while having the animals accustomed to handling and moving about at will is a very great help when it comes to their exhibition. It really pays to exhibit and sell the best of the pigs only. All others should be promptly prepared either as porkers or baconers and be disposed of. To those who hope to make a success of the stud pig business, the exhibition of stock at shows, advertising the stock for sale in suitable journals and papers, and prompt attention to correspondence and the supply of pedigree, &c., are features well worth note. There is no royal road to success, but there is no reason why with careful attention to the business aspect and regular and judicious handling of the stock, plus having good stock, you should not succeed.



Photo.: Miss J. Easton.]

PLATE 11.—“WHERE THE HORSES COME TO WATER AT THE RISING OF THE MOON.”
THE WILLOW-SHADED POND ON COOCHIN COOCHIN STATION, NEAR BOONAH.

General Notes.

Broom Millet Board Election.

The recent election for the appointment of two members to the Broom Millet Board resulted as follows:—

Hans Niemeyer, Hatton Vale, Laidley	..	..	78 votes
Erich Max Schneider, Binjour Plateau	..	..	76 votes
George William Harberger, Coalstoun Lakes	..	..	30 votes
Informal	..	..	2 votes

Messrs. Niemeyer and Schneider, together with the Director of Marketing, will therefore be appointed to the Board and will hold office for a term of one year as from the 18th May last.

Regulation Announcements.

Proclamation No. 5 under the Diseases in Plants Acts, dealing with the introduction of grapes from New South Wales and Victoria, has been rescinded, and a new Proclamation has been issued in lieu thereof.

This is practically identical with the old one, with the additional condition that grapes (fruit) from the Murrumbidgee Irrigation Area of New South Wales entering Queensland *via* Wallangarra must be branded with the word "Grapes" on one end of each case in letters of not less than 2 inches in height.

A regulation has been issued under the Diseases in Plants Acts, which provides that all tomato and potato plants must be sprayed or dusted with Bordeaux or Burgundy Mixture as follows:—

In the case of tomato plants—Firstly, in the seed bed; secondly, on being planted out; thirdly, thirteen days after being planted out; and fourthly, when the fruit is setting; and at any other such time as an inspector may direct.

In the case of potato plants—When the plants are 6 to 8 inches in height, and subsequently every seven to fourteen days, as weather conditions may warrant; and at any other such time as an inspector may direct.

Any person who does not comply with this regulation is liable to a penalty of £5 for a first offence, and not exceeding £20 nor less than £5 for a subsequent offence.

Wheat Pool.

A Proclamation has been issued to extend the Wheat Pool for a further period of five years after the 1927-28 season.

Provision is made for the taking of a poll upon the question of the extension of the pool. Any petition for a poll must be signed by at least five hundred growers who delivered wheat to the State Wheat Board during the seasons 1926-27 and 1927-28, and must reach the Minister not later than the 1st June, 1928.

Sugar Assessment.

The assessment for the 1928-1929 season under the Regulation of Sugar Cane Prices Acts and the Sugar Experiment Stations Acts has been fixed at the rate of 1½d. and ¾d. respectively on every ton of sugar-cane delivered at sugar works during the season. Such assessment is payable by the owner of sugar works in the first instance.

The assessment for last season was ½d. per ton under both Acts.

Assessments have also been levied under the Sugar Experiment Stations Acts for the purpose of financing Cane Pest Boards. The assessment for the Tully and South Johnstone Boards has been fixed at 1½d. per ton, and for the Lower Burdekin and Plane Creek Boards ¾d. per ton.

Wire and Wireless.

The Queensland Pastoral Supplies, Limited, announce important reductions in the price of fencing wire and netting. They have also perfected an excellent three-valve wireless set, which they are selling complete with all accessories and loud speaker. This set will bring in all main Australian Stations at reasonable loud speaker strength.

Cotton Board.

The Cotton Board has issued a notice requiring all growers of seed cotton to furnish a return showing the area under crop at the time of flood damage, the estimated quantity of cotton on bushes ready for harvesting destroyed by flood waters, and the estimated quantity of cotton harvested awaiting transport which has been destroyed by flood.

A Distinguished Visitor from South Africa.

Sir Arnold Theiler, K.C.M.G., of South Africa, in the course of a recent preliminary visit to Brisbane, prior to a tour of investigation in other States of the Commonwealth, met the members of the Commonwealth Tick Dip Committee at the office of the Department of Agriculture and Stock. Those present were Dr. W. A. N. Robertson (representing the Commonwealth Government), Messrs. J. C. Brunnich, A. H. Cory, and C. J. Pound (representing the Queensland Government), Messrs. M. Henry and C. J. Sanderson (representing the New South Wales Government), and Mr. R. P. M. Short, Secretary.

The investigations of the Committee were explained to the distinguished visitor, and advice given by him, as a result of his South African experiences, on the cattle tick will be of distinct benefit to the Committee in their operations. A visit was paid to the Samford Experimental Farm on the following morning.

It is the intention of Sir Arnold Theiler to visit this State for an extended period this month.

Wheat Board.

Regulation 3 under the Wheat Pool Acts has been rescinded, and a further Regulation approved, providing that representatives on the Board shall be elected by growers of wheat who delivered to the Board wheat harvested during either of the two previous seasons, by growers of wheat to whom seed wheat has been supplied by the Board for the year in which the election is held, and by other bona fide growers of wheat who may make application for and obtain a voting-paper.

Points in Citrus Marketing.

Production is only one-half of the business of profitable orcharding—the preparation of the crop for disposal is a matter of no less importance. The following points should be observed by the citrus grower in the marketing of his fruit:—

1. Exercise extreme care in handling.
2. Place fruit carefully in picking bags.
3. Carefully transfer fruit from picking bag to box.
4. See that the box has no protruding nails or splinters.
5. Do not jolt the fruit over rough roads.
6. Grade carefully for size and quality.
7. See that the sizing machine is functioning properly.
8. Use a clean case.
9. Pack neatly and tightly, but do not squeeze or jamb fruit into boxes.
10. Stack cases on sides.

The Orchard Ladder.

In many orchards one sees a huge, heavy ladder which one man shifts from tree to tree with difficulty, and it is so constructed that it cannot be conveniently placed to enable the operator to carry out his work expeditiously. Such a type of ladder often damages fruit spurs and fruit when being placed in position. Some ladders are in the last stages of decrepitude, some have lost steps, others are so rickety that if the ground is a little uneven they require to be supported while the operator is picking or pruning. Orchardists should take stock of their ladders, and, if they have not done so already, they should secure a strong, light, serviceable ladder, the use of which will economise time and labour.

It is not necessary to use sawn timber in making an orchard ladder. Anyone who is handy with tools can make a good ladder from the round bush timber which is very often easily obtainable.

Staff Changes and Appointments.

Messrs. A. L. M. Wilson, W. A. Douglas, B. Hart, A. C. Wishart, and Dr. G. Croll (of the Royal Queensland Yacht Club), and Mr. W. A. Winchester (Manager of Queen's Theatre, Bundaberg), have been appointed Officers under the Animals and Birds Acts. Constable W. H. Ewin, of Tallebudgera, has been appointed an Inspector of Slaughter-houses.

The resignation of Mr. J. Smith as Millowners' Representative on the Central Sugar Cane Prices Board has been accepted.

Messrs. F. M. B. Little, A. H. Biggs, H. Goodson, and R. Johnston, of the Southport District, and Mr. R. McCowan, of Brisbane, have been appointed officers under and for the purposes of the Animals and Birds Acts.

It has been approved that Mr. L. P. Doyle, Inspector of Stock, be attached to Cloncurry, and that Mr. J. Bishop, Inspector of Stock, be transferred from the Helidon to the Kingaroy District.

Mr. W. B. Christie, of Cooran, has been appointed Honorary Inspector under the Diseases in Plants Acts.

Mr. E. B. L. Filer, Assistant, Fruit Branch, has been appointed Temporary Inspector under the Diseases in Plants Acts as from 1st June, 1928.

The appointments of Miss N. Walsh and G. Becker as Assistant Cane Testers at Millaquin and Pleystowe Mills, respectively, have been rescinded, and Miss Walsh has been appointed Assistant Cane Tester at the Pleystowe Mill.

The following appointments of Cane Testers and Assistant Cane Testers for the 1928 crushing season have been made:—

Cane Testers—T. D. Cullen, Bingera; Miss I. McGill, Fairymead; C. H. Jorgensen, Gin Gin; Miss I. Palmer, Isis; Mrs. Kate Dunton, Maryborough; C. J. Boast, Millaquin; Miss A. L. Levy, Moreton; Mr. T. V. Breen, Mossman; L. G. H. Helbach, Pleystowe; Miss M. T. Smith, Plane Creek; Miss D. Marles, Qunaba; V. F. Worthington, Racecourse; J. Howard, Rocky Point; W. Ahern, Cattle Creek; L. McCready, Farleigh; T. P. Brown, Marian.

Assistant Cane Testers—Miss M. Orr, Bingera; Miss O. Knight, Farleigh; Miss M. A. Lyle, Marian; Mr. H. T. Whitchee, Maryborough; Miss N. Walsh, Millaquin; Mr. G. Becker, Pleystowe; Miss E. Rowe, Pleystowe; Miss M. Morris, Plane Creek.

Mr. J. Carew, Assistant Instructor in Sheep and Wool, has been appointed Acting Instructor in Sheep and Wool, Department of Agriculture and Stock, as from 24th May, 1928, and until 31st December, 1928.

The following transfers have been approved, of Inspectors under the Diseases in Plants Acts:—

Mr. T. Lowry, at present attached to Stanthorpe, to be attached to Brisbane;

Mr. F. A. L. Jardine, at present attached to Nambour, to be attached to Stanthorpe;

Mr. E. J. Lorraine, at present engaged on wharf and market inspections, to be transferred to outside field inspections.

It has also been approved that Mr. H. St. J. Pratt, Assistant Instructor in Fruit Culture, undertake the supervision of the inspectors in the Stanthorpe District.

Mr. L. A. Downey, of Hawkesbury Agricultural College, Richmond, New South Wales, has been appointed Assistant Instructor in Pig Raising.

Mr. W. H. Bechtel, Manager of Warren State Farm, has been appointed Acting Assistant Instructor in Agriculture at Rockhampton.

The resignation has been accepted of Mr. H. J. Campbell, Inspector of Slaughter-houses.

Mr. H. Jensen, Miss E. Christsen, and Messrs. P. H. Compton and T. Herbert have been appointed Cane Testers at the Babinda, Pioneer, South Johnstone, and Tully Mills, respectively, and Miss M. Bennett has been appointed Assistant to Cane Tester at the Tully Mill.

Constable R. G. Kinnane, of Dalby, has been appointed Inspector of Slaughter-houses.

Constable J. S. Harper, of South Kolan, has been appointed Inspector of Slaughter-houses.

Mr. J. C. Pryde, of Spring Bluff, has been appointed Temporary Inspector of Stock at Rockhampton until the 4th July, 1928.

Messrs. M. Wilshire, S. R. Scott, E. B. Loel, E. L. Carpenter, J. Wilson, H. Middleton, V. I. Spalding, S. O. D. Arthur, John Newlands, W. J. Newlands, and C. D. Thompson (Inspectors under the New South Wales Diseases in Stock Act) have been appointed Inspectors of Stock, to operate in the Stock District of Warwick.

The appointment of Mr. H. H. Jennings, of Texas, as Acting Inspector of Stock has been cancelled.

The Officer in Charge of Police, Jondaryan, has been appointed Acting Inspector of Stock as from 26th May, 1928, and Mr. P. J. Short, Temporary Inspector of Stock at Goondiwindi, until the 31st July, 1928, during the absence on leave of Mr. Singh.

Mr. J. Macfie has been appointed Inspector of Cane Testers, with headquarters at Bundaberg.

Constable B. M. Howard, Stewart's Creek, has been appointed Inspector of Stock and Brands, and Constable E. Brown, Ewan, Inspector of Brands.

Mr. J. D. W. Ogilvie, Dairy Instructor, Ipswich, has been appointed Grading Inspector, Dairy Branch, Department of Agriculture and Stock.

Mr. E. S. Smith has been appointed Millowners' Representative on the Central Sugar Cane Prices Board, vice Mr. J. Smith, resigned.

Constable W. Lafferty, of Jericho, has been appointed Inspector of Slaughter-houses.

Dr. N. M. Gutteridge, of Toowoomba, has been appointed an Officer under the Animals and Birds Acts.

The appointments of Messrs. N. James and W. Broome as Honorary Inspectors under the Diseases in Plants Acts have been cancelled.

Mr. F. R. Pearce, of Kolijo, N.C.L., has been appointed Canegrowers' Representative on the Farleigh Local Sugar Cane Prices Board, vice Mr. J. McIntyre, resigned.

The Royal Society of Queensland.

The ordinary monthly meeting was held in the Geology Lecture Theatre of the University on Monday, 28th May, 1928.

The President, Professor T. Parnell, was in the chair, and fourteen members were present.

Messrs. W. J. Chamberlain, M.Sc., Inigo Jones, and T. Rimmer, M.Sc., were elected ordinary members of the Society.

Mr. F. W. Moorhouse, B.Sc., was nominated for ordinary membership by Mr. D. A. Herbert, and Mr. R. C. Cowley by Dr. J. V. Duhig.

Mr. A. P. Dodd, in a few introductory remarks, tabled a paper on the "Revision of Four Genera of Scelionidæ."

Mr. A. P. Dodd also delivered a very interesting lecture on "Prickly-pear Insects." In outlining the subject he pointed out that the prickly-pears (*Opuntia* spp.) had been introduced into Australia without their natural enemies. Owing to this, and to favourable climatic conditions, they had spread rapidly and become a pest. In their native habitats, Southern North America and South America, the various forms of prickly-pear were kept in check by natural enemies in the shape of insect pests.

The Prickly-pear Board has concentrated its activities on investigating insects adversely affecting the pear and on introducing those found the most effective. On arrival they are carefully tested by laboratory and field experiments, to ascertain whether they will attack economic or other plants as well as members of the *Opuntia* family.

Mr. Dodd gave an interesting review of the introduction, breeding, testing, and liberation of insects, and he stated that so far the Indian cochineal and cactoblastus had proved the most effective, and with the aid of these insects the prickly-pear was now held in check from spreading, and there is every probability of its gradual extermination.

Mr. C. T. White, in proposing a vote of thanks to the lecturer, paid a tribute to the good work being carried on by Mr. Dodd and his staff. Mr. J. B. Henderson, in seconding the motion, outlined the events leading to the formation of the Prickly-pear Board, and gave instances of the very effective work of pear destruction.

Clean up the Packing Shed.

A thorough clean-up of the packing shed should be made before closing it down at the end of the packing season.

All cases or other receptacles that have held fruit should be dipped under boiling water for not less than three minutes, and any sacking used on packing benches should be similarly dipped, or if valueless, burned. All cracks and holes in benches or other packing-house appointments should be probed, and any lurking codling or other injurious insect larvæ killed. At all times the sweepings from a packing shed should be thrown on to a fierce fire. Codling moth bandages are best left on the trees till well into the winter.

Pruning operations offer the best opportunity for a close tree-to-tree scrutiny for pests such as San Jose scale. Affected trees should be marked for future treatment.

Scab in Potatoes.

There are three common causes of scab in potatoes; two distinct types result from the action of fungous parasites and the third is caused by eelworms.

Rhizoctonia scab (the form perhaps most frequently found) receives its name from the fungus (*Rhizoctonia solani*) which is the cause of the disease. This fungus is readily recognised on affected tubers in the form of small black masses or lumps, which vary greatly in size and shape. On account of this feature the disease is sometimes called "black speck scab" or "black scurf." The fungus structures at first sight appear like lumps of soil, but they show up distinctly black when wetted and they do not wash off. The superficial position of the fungus sometimes leads growers to think that the disease is of little importance. The black bodies, however, represent the resting stage of the fungus, which is able to develop rapidly under favourable conditions.

Generally speaking the disease results in most damage under cool moist conditions. It may attack any of the underground portions of the plant. The young growing shoots may be entirely destroyed. In other cases the disease may develop on the underground stem, stolons, or roots, where it is readily recognised in the form of brown discoloured areas. When the stem is severely attacked, or when the stolons are girdled, a number of small tubers may be produced on the stem and in axils of the leaves. Frequently also the leaves become bunched in the form of a rosette.

Unfortunately the fungus is able to live in the soil in the absence of the potato plant and it may grow on a number of other root crops and grasses. Once a soil becomes heavily infested little can be done to exterminate the disease. In most instances, however, the disease arises from the use of untreated, diseased tubers.

Every care should be taken that the disease is not introduced at the time of planting. Clean selected seed should be used whenever possible. This, however, is not always practicable, but effective control may still be obtained by seed treatment in a fungicidal solution of either corrosive sublimate (mercuric chloride) or formaldehyde. Dipping the seed before sowing should be adopted as a general practice and, generally speaking, corrosive sublimate is more effective than formaldehyde for this purpose.

A caution is necessary. Corrosive sublimate is a deadly poison if taken internally by stock or by human beings. The solution, however, is quite harmless on the hands. Treated potatoes are unfit for domestic use or for feeding to stock.

The solution is made up of corrosive sublimate (mercuric chloride) 1 oz. and water 6½ gallons. The corrosive sublimate should be dissolved in about a quart of warm water and then diluted to the required amount. A wooden vessel should be used since the chemical will attack metal and thus lose its strength.

The seed potatoes should be immersed for from 1½ to 2 hours. It is inadvisable to dip the potatoes in bags, since this weakens the solution. It is far better to place the tubers directly in the solution or else to use a small wooden crate. The solution should not be used for more than three batches at a time. This is particularly necessary if there is much dirt adhering to the tubers, as there is then a tendency for the solution to weaken very rapidly. The tubers should not be cut and preferably should not be sprouted. If they have sprouted slightly every care should be taken not to injure the sprouts and the time of dipping should be shortened.

It is a good plan to keep the tubers moist for twenty-four hours before treatment to loosen the dirt and soften the fungous material, which is then more readily killed by the fungicidal treatment.

Objectionable Flavours in Cream.

Although it is most desirable from many points of view that cows should have a plentiful supply of good, clean drinking water, sometimes the water is blamed for second-quality cream, when in reality it has nothing whatever to do with it. Although tainted drinking water can, and does, impart certain flavours to cream, it rarely happens that such flavours cause the cream to be graded second quality. Whatever flavour the water may impart is absorbed from the body of the cow before and during the secretion of the milk, and it does not become worse as the cream is kept, but sometimes gradually disappears. In any case, it can usually be partially or wholly removed by the ordinary treatment at the factory. This class of flavour is not so important for that reason.

Bacterial flavours, for instance, gradually become worse and worse as the cream is kept, but absorbed flavours imparted by water do not. Where cows wade in muddy pools or waterholes, it is the contamination they carry out on their legs, flanks, tails, and udders which causes trouble later on. This is one of the commonest causes of ropy milk or cream. The bacteria responsible find their way into the bucket during milking, and from there into other utensils or separator parts, where they may exist for some considerable time, unless proper precautions are taken. The boiling water treatment will kill the bacteria responsible for ropy cream.

A Bad Practice.

The mixing of warm, freshly separated cream with a cold, ripe cream from a previous separation is very often accompanied with disastrous results as regards quality. It is bad practice for several reasons, one being that the temperature of the bulk of the cream is thereby increased, resulting in increased bacterial activity. Again, if the older cream is very acid and thinly separated, the casein will most likely be precipitated in the form of white specks, which everyone is acquainted with as ordinary curdled cream, or again a "junkety" condition may be brought about. All these defects may result in the cream being graded second quality.

Fortunately, this practice is fast disappearing, but it sometimes occurs where cream is forwarded daily to the factory. The cream lorry comes soon after the morning separation, and in order to get both separations away the creams are mixed while the morning separation is still warm. "Junkety" cream often occurs where this is done, and to obviate it the morning cream should be cooled before mixing. If a cooler is not available for this purpose, by standing the tub in a can of water and stirring the cream briskly for ten minutes the temperature can be reduced slightly.

Five Functions of Food for Milch Cows.

Improper feeding of dairy cows is one of the chief causes of unprofitable dairying. This is evidenced if the butter production in a good year be compared with that in a bad year. Proper feeding alone does not suffice to secure the greatest productivity, points out a departmental pamphlet, but must be accompanied by good care and management. It has been demonstrated that the production of some poorly-kept cows can be increased as much as 50 per cent. by improved methods of feeding and care.

It must not be forgotten that a cow may use a feed for five different purposes:—

1. Growth.—Since cows do not mature until they are four or five years old allowance must be made for growth requirements.
2. Maintenance.—A certain amount of the feed is used simply to maintain the body without gain or loss in weight.
3. Production of Milk.—Necessitating feed in addition to that used for maintenance.
4. Increase in Weight.—Cows normally increase in weight during the latter part of their lactation period and during the rest period. This increase requires feed.
5. Production of Offspring.—The fifth purpose for which a cow requires feed; the amount, however, is relatively small.

It is evident that in feeding for milk production, the various functions which feed fulfils must be considered with regard to the future development of the cow as well as to her immediate needs. Liberal feeding usually proves much more profitable in the long run than scanty feeding.

Points in Maize Seed Selection.

1. Select seed in the field only from those plants which produce good ears under normal or adverse conditions of space, &c.
2. Do not select for two or more ears on the stalk unless the first is up to standard size and quality.
3. Select ears which are at a medium height on the stalk, neither too high nor too low.
4. Select only those ears which are well covered and protected by the husk. Only such ears remain free from weevil infestation in susceptible districts.
5. Select ears which droop when approaching maturity for increased resistance of the variety to weather damage. Erect ears are usually found on short, thick shanks.
6. Select ears from those plants which produce a large ear for a limited growth of stalk for economy in grain production.
7. Avoid the selection of those ears from plants which are blown down or broken down, no matter how good the ears may appear. Root and stalk rot diseases are transmitted readily through the seed. With regard to the diseases just referred to take care also (a) to avoid ears from prematurely ripened stalks, (b) to regard brace-rooted stalks with suspicion, (c) to select seed early to more largely prevent mycelium of the fungus penetrating the seed by systematic infection, (d) to dry seed ears quickly by storing in a dry, warm, well-ventilated place in an endeavour to prevent the fungus (if any) making further growth from the core into the seed.
8. Maintain a special seed plot of field-selected seed.

Milking Machines and Cleanliness.

The secret of getting good milk and cream where milking machines are used is absolute cleanliness from the start. Once the rubber parts get contaminated they cannot be cleaned—to throw them away and get new ones is the only course.

A thorough cleaning once a week is not going to result in choicest grade at the factory. All parts of the machine must be cleaned carefully every day, and between milkings the inflations and tubes should be soaked in lime water, renewing the lime water often, as it soon becomes stale and smelly.

When removing cups from one cow to another care should be taken to see that they are held so as to fall over and break the suction. If they are carried face towards the ground all the dust and manure on the floor is sucked into the tube and thence into the buckets and vat.

Milking machines require a good deal of attention and punctilious care in cleaning if they are to prove satisfactory.

Roughage for Dairy Cows.

Roughage is often the cheapest form of digestible nutrients, and cows should be allowed all the roughage they can consume. Maize silage and lucerne hay are probably the ideal roughage for a dairy cow. They should be fed at the rate of 3 lb. of silage and 1 lb. of hay for each 100 lb. of live weight. Lucerne hay being a legume is much superior to non-leguminous hay for cows in milk. The non-leguminous hays are low in digestibility, tend to be constipating, and are low in protein and mineral matter. They are often useful in limited amounts when fed with some high quality lucerne hay.

The remarkable qualities of maize silage and lucerne hay as a ration for milk production have been demonstrated in the Jersey herd at Hawkesbury Agricultural College, New South Wales. Recent figures show that the average amount of feed consumed per head daily by cows under test was 30 lb. of silage and 10 lb. of lucerne hay, while the average production of milk during the same period was 26.24 lb. per head daily. For the above reason alone, lucerne can be described as the best fodder crop grown for the purpose of feeding cows. It is particularly useful in balancing all rations, especially where green maize is grown. Lucerne should be grown on all dairy farms where the object is to feed for milk production.

For providing fodder in the winter, farmers cannot be too strongly advised to grow a green cereal crop, such as green oats or green barley. These can be mixed with either vetches or field peas. They should be chaffed for preference with the ration, but good results are also obtained by grazing.

The Home and the Garden.

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size, when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil, and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

ANIMAL MANURES.

Farmyard manures are solid and liquid excreta from animals, and form one of the universal manures used by most gardeners—complete for all purposes in horticulture. It must, however, be used with care and intelligence. In some places where large and cheap supplies are available, the soil is saturated with manure.

The greater the quantity of manure incorporated with the soil, the greater the necessity for plenty of fresh air to bring about decomposition and ultimately humus. Now, if a soil has not been deeply dug or trenched, and it happens to be of a heavy nature, it is possible that the rains will not pass away readily; then the manure begins to get sour, fresh air, with its oxygen is driven out, carbonic acid gas develops too freely, and the beneficial bacteria are suffocated or annihilated by their enemies, which come into being owing to the lack of fresh air.

To avoid these troubles the soil should be well and deeply dug, and whenever extra large quantities of manure are used, the soil should be afterwards dressed with lime to keep it in a sweet condition.

FLOWERING SHRUBS.

Lagerstræmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana*, the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20ft.

The plant stands severe trimming, in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken

from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia, now they are rarely seen. *G. Thunbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and have not the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the north. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madona," Carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine coloured variety and the canary yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohlrabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberose, amaryllis, paneratium, ismene, erinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

Farm Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before re-bagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Orchard Notes for August.

THE COASTAL DISTRICTS.

The remarks that have appeared in these notes from time to time respecting the handling and marketing of citrus fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the spring growth. All heavy pruning should be completed previous to the rise in the sap; and where winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with lime and sulphur wash.

Where citrus trees are showing signs of failing, such as large quantities of dead or badly diseased wood in the head of the tree, they can (provided the root system is healthy) be renovated by cutting back the entire top of the tree till nothing but sound healthy wood is left. This should be thinned out, only sufficient main limbs being left from which to form a well-balanced tree, and the trunk and limbs so left should receive a dressing of lime sulphur, or Bordeaux paste.

Healthy trees that are only producing inferior fruit should be treated in a similar manner, and be either grafted with an approved variety direct or be allowed to throw out new growth, which can be budded in due course. The latter method is to be preferred, and an inferior and unprofitable tree can thus be converted in the course of a couple of years into a profitable tree, producing good fruit.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the tree's use during spring. This is a very important matter, as spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

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Do not be afraid if you cut a number of surface roots when ploughing the orchard, but see that you do cut them, not tear them. Use a disc plough and keep the discs sharp, and the root-pruning the trees will thus receive will do more good than harm, as it will tend to get rid of purely surface roots.

Planting of all kinds of fruit trees can be continued, though the earlier in the month it is completed the better, as it is somewhat late in the season for this work. The preparation of land intended to be planted with pineapples or bananas should be attended to, and I can only reiterate the advice given on many occasions—viz., to spare no expense in preparing the land properly for these crops—as the returns that will be obtained when they come into bearing will handsomely repay the extra initial expense. Growers of pineapples and bananas who send their fruit to the Southern markets should take more care in the grading and packing of such fruit, as their neglect to place it on the market properly means a big difference in price, and entails a loss that could be avoided had the necessary care and attention been given. The same remarks apply to the marketing of citrus fruits, papaws, custard apples, strawberries, cucumbers, and tomatoes, all of which are in season during the month.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You want only one strong shoot from your cutting, and from this one shoot you can make any shaped vine required. The spraying of vines for downy mildew is not compulsory, but an application eliminates black spot.

Fruit fly will make its appearance during the month, and citrus and other fruits are likely to be attacked. Every grower should, therefore, do his best to destroy as many flies as possible, both mature insects and larvæ, the former by trapping or otherwise, and the latter by gathering and destroying all infested fruit. If this work is carried out properly, a large number of flies that would otherwise breed out will be destroyed, and the rapid increase of the pest be materially lessened. The destruction of fruit flies early in the season is the surest way of checking this serious pest.

Keep a careful lookout for orange-sucking bugs, and destroy every mature or immature insect or egg that is seen. If this work is done thoroughly by all citrus growers there will be far fewer bugs to deal with later on, and the damage caused by this pest will be materially reduced. Destroy all elephant beetles seen on young citrus trees, and see that the stems and main forks of the trees are “painted” with a strong solution of lime sulphur.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all deciduous trees should be finished during the month, and all such trees should be given their annual winter spraying with lime sulphur. The planting of new orchards should, if possible, be completed, as it is not advisable to delay. Later planting can be done in the Granite Belt, but even there earlier planting is to be preferred.

Peach trees, the tops of which have outlived their usefulness and of which the roots are still sound, should be cut hard back so as to produce a new top which will yield a good crop of good fruit the following season in from fifteen to eighteen months, according to the variety.

Apple, pear or plum trees that it is desirable to work over with more suitable varieties should also be cut hard back and grafted. All almond, peach, nectarine, and Japanese plum trees should be carefully examined for black peach aphid, as, if the insects which have survived the winter are systematically destroyed, the damage that usually takes place from the ravages of this pest later on will be materially lessened.

Woolly aphid should also be systematically fought wherever present. The best all-round remedy for these two pests is spraying with black leaf 40.

In the Granite Belt the pruning of vines should, however, be delayed to as late in the season as possible, so as to keep the growth back and thus endeavour to escape late spring pests.

Where orchards and vineyards have been pruned and sprayed, the land should be ploughed and brought into a state of as nearly perfect tilth as possible, so as to retain the moisture necessary for the proper development of the trees or vines and the setting of their fruit.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

Date.	July, 1928.		August, 1928.		July, 1928.	Aug, 1928.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6.46	5.6	6.35	5.21	p.m. 3.29	4.50
2	6.46	5.6	6.34	5.22	4.15	5.50
3	6.46	5.6	6.34	5.22	5.6	6.52
4	6.46	5.6	6.33	5.23	6.1	7.53
5	6.46	5.7	6.33	5.23	6.56	8.55
6	6.46	5.7	6.32	5.23	8.0	9.55
7	6.46	5.8	6.31	5.24	9.1	10.57
8	6.45	5.8	6.31	5.24	10.1	11.59
9	6.45	5.9	6.30	5.24	11.1	...
10	6.45	5.10	6.29	5.25	...	a.m. 1.7
11	6.44	5.11	6.28	5.26	a.m. 12.3	2.15
12	6.44	5.12	6.27	5.27	1.4	3.19
13	6.44	5.12	6.26	5.28	2.19	4.22
14	6.44	5.12	6.25	5.29	3.23	5.20
15	6.43	5.12	6.25	5.29	4.36	6.12
16	6.43	5.13	6.24	5.30	5.33	6.53
17	6.43	5.13	6.23	5.30	6.34	7.35
18	6.43	5.13	6.22	5.31	7.32	8.5
19	6.43	5.13	6.21	5.31	8.31	8.36
20	6.42	5.14	6.21	5.31	9.0	9.6
21	6.42	5.14	6.20	5.32	9.37	9.37
22	6.42	5.15	6.20	5.32	10.9	10.10
23	6.41	5.15	6.19	5.32	10.37	10.42
24	6.41	5.16	6.18	5.32	11.17	11.19
25	6.40	5.17	6.16	5.33	11.37	noon 12.9
26	6.40	5.17	6.14	5.33	p.m. 12.5	p.m. 12.49
27	6.39	5.18	6.13	5.34	12.44	1.42
28	6.38	5.18	6.11	5.34	1.23	2.38
29	6.37	5.19	6.10	5.35	2.8	3.38
30	6.37	5.20	6.9	5.35	2.59	4.40
31	6.36	5.20	6.7	5.36	3.53	5.43

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

3 July ☉ Full Moon Midnight.
 10 „ ☾ Last Quarter 10 0 p.m.
 17 „ ● New Moon 2 0 p.m.
 25 „ ☾ First Quarter 12 38 a.m.

Perigee, 15th July at 1 6 a.m.

Apogee, 26th July at 10 6 p.m.

Mars will be passing Jupiter from west to east on the 3rd. The two planets will seem to be very near to one another for several nights, before and afterwards. A distance equal to the width of the Moon will apparently separate them a fortnight later. The constellation Aries will form the background till the end of the month.

The earth will be in aphelion on the 4th, when it will be three million miles further from the Sun than it was on 4th January.

Mars will be occulted by the Moon on the 12th about 1 p.m. at places a little south of Townsville, but somewhat earlier in Southern Queensland. The nearness of the Sun will prevent them from being a good daylight spectacle.

The conjunction of Jupiter and the Moon at 5 o'clock in the morning of the 12th will form an interesting spectacle, with Hamal, the principle star of Aries, as the nearest and brightest star to the northward.

The conjunction of Mercury with the waning Moon on the 15th, about an hour and a-half before sunrise, will be interesting. The groups of the Hyades and Pleiades in Taurus will be higher up in the sky and more to the northward.

Mercury will be at its greatest western elongation, 20 degrees on the 21st, and will be favourably situated for observation after sunset.

The conjunction of Saturn and the Moon will take place at 1 p.m. on the 28th, when both are below the eastern horizon.

A small star in Sagittarius will be occulted about 10.45 p.m. at places a little south of Townsville, and somewhat earlier farther south.

2 Aug. ☉ Full Moon 1 30 a.m.
 9 „ ☾ Last Quarter 3 24 a.m.
 15 „ ● New Moon 11 49 p.m.
 23 „ ☾ First Quarter 6 21 p.m.
 31 „ ☉ Full Moon 12 34 p.m.

Perigee, 11th August, at 2.54 a.m.

Apogee, 23rd August, at 4.42 a.m.

Epsilon Capricorni will be occulted on the 2nd about 8 p.m., and will form an interesting observation for those who have a telescope or binoculars, which will be required to see so small a star near the southern edge of the almost full moon.

About two-and-a-half hours later Kappa Capricornia will also be occulted, the exact time depending upon the position of the observer who may find it advisable to look for the star on the south-eastern side of the Moon ten or twenty minutes earlier.

The occultation of Jupiter on the 8th unfortunately will occur several hours before the planet will be seen above the eastern horizon.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]



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THE INCOME TAX ASSESSMENT ACTS, 1922-1927 (FEDERAL).

THE INCOME TAX ACTS, 1924-1926 (STATE).

THE LAND TAX ACTS, 1915-1927 (STATE).

NOTICE is hereby given that every person, firm, and company liable to make returns under the above Acts are required duly to make and furnish to me on the prescribed form or forms a return of—

(a) His or its income of the year ended **30th June, 1928**, and

(b) Particulars of land owned at midnight on **30th June, 1928**.

The returns are to be furnished not later than the dates set out hereunder:—

(1) INCOME TAX RETURNS (STATE AND FEDERAL COMBINED RETURN):—

Due Date for Lodgment of Returns:—

(a) Employees only or persons in receipt of income from Property only (use Form B), **31st JULY, 1928**.

(b) All other persons and firms (use Form A), **31st AUGUST, 1928**.

(c) All companies (use special Forms provided), **31st AUGUST, 1928**.

(2) LAND TAX RETURNS (STATE ONLY), **30th SEPTEMBER, 1928**.

Returns are to be addressed to the Commissioner of Taxes, State Government Insurance Building, Brisbane.

Penalty for failure to render a return by the due date, £100.

Dated this twenty-eighth day of June, 1928.

H. MAGEE,

Commissioner of Taxes and Deputy Federal Commissioner of Taxation.

NOTE.—Return forms may be obtained at any Post Office or Office of Clerk of Petty Sessions, or at the Land and Income Tax Office, Brisbane.

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Departmental Announcements

IT is hereby notified that the "Journal" will be supplied to all members of Agricultural and Horticultural Societies in Queensland who do not derive their livelihood solely from the land on payment, in advance, of an annual subscription of 5s., which will include postage. Queensland Schools of Arts will be supplied free of charge on the prepayment of 1s. per annum to cover postage. Persons resident in Queensland whose main source of income is from Agricultural, Pastoral, or Horticultural pursuits, which fact should be stated on the attached Order Form, will receive the "Journal" free

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To all other persons the annual subscription will be 10s., which will include postage.

All remittances should be made by postal notes or money orders, but where they are unobtainable stamps will be accepted, though the Department accepts no responsibility for any loss due to the latter mode of remittance.

For your convenience an Order Form is attached. A cross on the first page of the "Journal" indicates to the recipient that his subscription is again due. Watch also the wrappers on the "Journal."

Amount of one year's subscription should be forwarded with Order Form before the 15th of the month to the **Under Secretary**, Department of Agriculture and Stock, Brisbane.

All new subscriptions or renewals received for the "Journal" after the tenth day of the month will commence with the month after that on which the subscription is received. Previous copies available will be supplied at 6d. per copy to subscribers only. To all others 1s. per copy.

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NOTE.—Subscribers who wish to obtain the Journal for the month when the subscription is sent, must apply before the fifteenth of that month.

The Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

Secretaries of Associations are requested to be good enough to forward to the Editor, as early as possible, the dates of forthcoming Shows, as it is important in the interests of the Associations that these dates should be published. Changes in dates must also be promptly advised.

To enable recipients of the "Queensland Agricultural Journal" to have the half-yearly volume bound, Covers in Boards and Cloth will be supplied from this Office on application to the Under Secretary for Agriculture. Applications must be accompanied by a remittance to cover cost. Covers will be supplied at **One Shilling and One Shilling and Ninepence** each.

In order to avoid disappointment, correspondents who wish for replies to questions in the "Journal" are requested to note that it is imperative that all matter for publication on the first day of any month should reach the Editor by the 15th of the previous month.

We would ask our Subscribers to note that, when their Subscription has run out, a **Cross** is placed on the first page of the "Journal." It often happens that this intimation is disregarded, with the result that the "**Journal**" is **not posted** to the Subscriber. The Department cannot guarantee to supply back numbers in such cases.

Pamphlets on different subjects relating to Agriculture, Horticulture, and Stock are issued by the Department, and may be obtained **gratis**, on application to the Under Secretary.

Farmers who wish to **Advertise** products, &c., in this "Journal" should address all inquiries in relation thereto to the Government Printer, Advertising Branch, Brisbane.

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The Minister for Agriculture and Stock, in order to assist farmers who carry not exceeding 1,500 sheep upon their holdings, to obtain the best prices for their wool, is prepared to receive such wool on owners' account, classify it, and place it upon the market so that it will not be sold under the star-lot conditions as it has usually been sold.

A correct account of the wool will be kept and each farmer will receive the amount received for same, less the necessary charges, which will consist only of the following:—

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The wool will be sold at the first wool sales following a sufficient accumulation to enable a bulk sale to be made.

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The weights as taken in the Departmental Store, and the classification before sale, to be accepted as being final.

RECOMMENDATIONS.

(a) The bales should be branded on the cap only, so that the same packs, if in good order, may be used again. This saves the price of a new pack to the farmer.

(b) The wool requires no other treatment on the farm other than the removal of dags before rolling the fleeces.

(c) Locks and belly wool should be kept in separate packages.

E. GRAHAM, Under Secretary,
Department of Agriculture and Stock.

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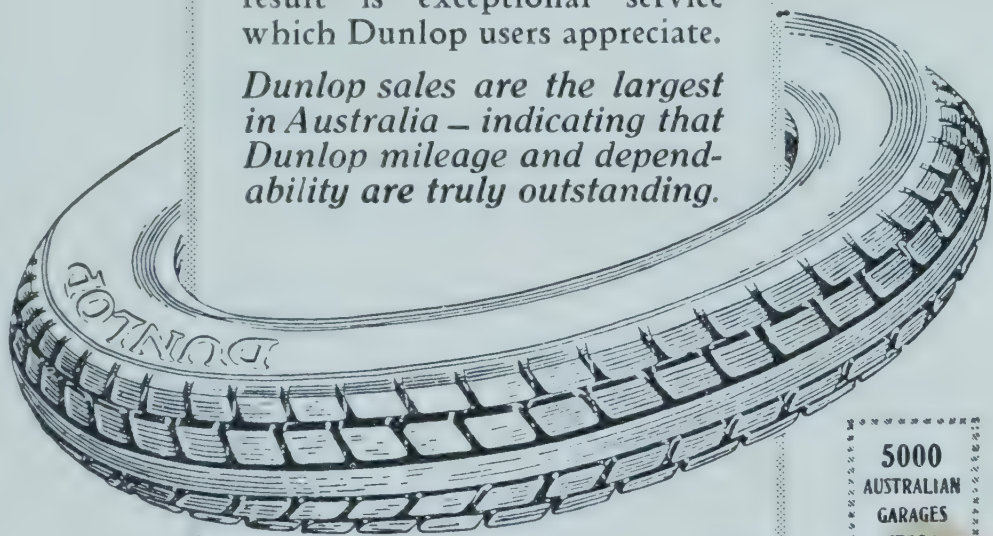
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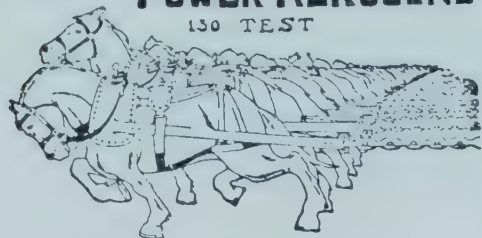
Issued by direction of

The Hon. the Secretary for Agriculture

.....
Edited by J. F. F. REID
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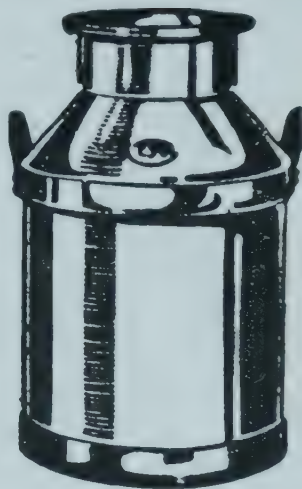
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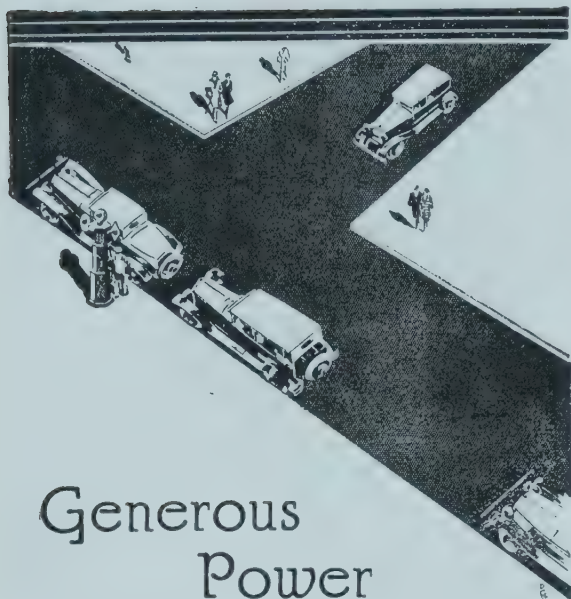
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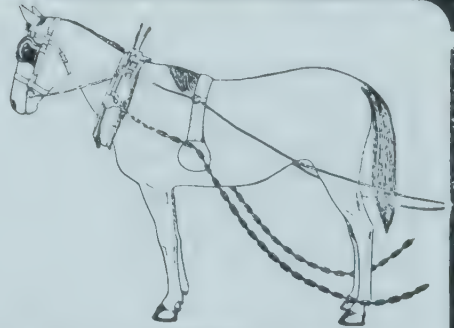
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QUEENSLAND AGRICULTURAL JOURNAL

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PART 5

Event and Comment.

The Agricultural Situation in Queensland.

IN the course of a general survey of the agricultural position in Queensland in the Annual Report of the Department of Agriculture and Stock, the Under Secretary, Mr. E. Graham, says that the Queensland farmer now possesses much greater bargaining power than he had formerly through centralised selling, which has followed the establishment of commodity boards and the consolidation of existing co-operative associations on a commodity basis.

While the fundamentals of efficient production are not being neglected, the importance of finding solutions for economic and social problems affecting the man on the land is recognised, not only by leaders in the industry but by others who are more or less concerned directly in the improvement of agriculture in this country. It is plain that constructive effort must be directed towards the attainment of a true balance in the industry, and to accomplish this it must cover the whole range of capitalisation, production, marketing, distribution, and consumption. The Department is giving increased attention to economic investigation, and some results of this work have been circulated widely, to the general advantage of those engaged in primary enterprise.

A fuller understanding or appreciation of country life, its special problems and relative matters, is evident among farmers, and they are, through their organisations, developing a definite sense of direction towards agricultural betterment.

Both on the production and marketing sides there is a greater tendency to get right down to business, to work along proven lines and make full use of present means, improving them where possible, and extending methods that have stood practical test.

The Farmer Must make his Own Standards.

THE variation in production on different holdings and in different districts suggests the opportunities that are in the hands of the farmers themselves of modernising methods of cultivation and improving the quality of crops, thus lessening costs. Individual action is quite as important as co-operative action in the establishment of high standards of production, and in the regulation of output, whether in respect of quality or volume, to comply with market demands. However efficient public or community services, commodity boards, or co-operative enterprises may be, the farmer's business success, if climatic and other hazards beyond control are eliminated, is in his own hands. He must primarily make his own standards of living for himself. Inefficiency in farm practice, or lessened productivity, must react inevitably to his disadvantage against any measure designed to extend the radius of his opportunity.

With the return of good seasons the cattle industry is moving once more towards prosperity.

Dairying in Queensland.

DAIRYING is in a relatively favourable position, and dairy farmers are realising, in the main, that the production of high quality milk and increased quantity of butter-fat from fewer cows at less cost is the quickest way of increasing the net farm income. Our average yearly output of butter-fat per cow is far too low, and it is apparent that many dairy farmers are not making any substantial profit on their business.

These facts were confirmed by a Departmental investigation into the economics of the industry, which was continued in the course of the year. Some of the results have been published, and further particulars will be circulated from time to time.

In many districts in Queensland dairying may be carried on under the congenial conditions that are conducive to high quality production, and it is reasonable to expect that the average yield of milk per cow in Queensland should be greater than it actually is. It is realised that our averages are based on the production of all herds registered, without any regard to the fact that some herds are milked only during the period of the year in which the natural pastures are abundant. This practice obviously lowers the average production, as computed for statistical purposes, of our full-time dairy herds.

The records of the Department, however, indicate a very wide variation in the production of butter fat per cow in the herds tested (and it may be assumed that these herds are not below the average in output), and there is, therefore, considerable room for herd improvement in the State, a phase of the dairying industry to which the Department is giving full attention.

Every opportunity is taken of impressing the dairyman with the necessity of making adequate provision for the storage of fodder. It is recognised that, for various reasons, fodder conservation is not always practicable, and those who condemn the improvidence of the dairy farmer often fail to appreciate these circumstances. After making due allowance, however, for the difficulties facing some producers, the practice of providing ample stores of fodder is not as general as it should be, and it is a matter that calls for the serious consideration of every dairy farmer who aims to control a prosperous enterprise.

The Board of Agriculture.

IN the course of the year the Board of Agriculture was constituted as a co-ordinating agency for the prevention of overlapping in scientific and other investigations designed to benefit agriculture in Queensland. A survey of the investigational work now proceeding has been made with a view to determining what overlapping, if any, exists, the measures to be adopted to secure effective co-ordination and co-operation, and other relevant matters. A register of agricultural research, experimental and demonstration work, has also been compiled for the information of the Board in formulating its plans.

Banana Experiment Stations.

UNDER the provisions of "*The Primary Produce Experiment Stations Act of 1927*" it has been decided to establish two banana experiment stations, one at Kin Kin East, near Gympie, and the other at Pawngilly, on the Russell River. They will, it is considered, meet the present requirements of the banana industry.

The main object of these stations is to enable the Department to carry out various forms of necessary research work, and to secure co-ordination among all concerned in the progress of primary industry.

These stations will be similar to the Sugar Experiment Stations already established in their operation and the character and quality of their service to the farming community. The approximate annual value of the banana industry is £1,000,000 sterling; and it is ordinarily a profitable enterprise capable of considerable improvement and much greater expansion. The upkeep of the stations will be a charge in the form of a levy on the industry which they benefit. The fund so accumulated will be subsidised. The principle is accepted that where growers are interested financially in a scheme they will take a more active interest in contributing to its success, and this will, no doubt, ensure complete co-operation between the Department and the farmers concerned.

Much useful work has already been performed in connection with the banana industry, and those engaged in it have, as a rule, applied themselves very closely to the problems with which it is beset, achieving some considerable results, but obviously much yet remains to be done.

There are large areas in the State suited to the cultivation of the fruit, and the districts in which the industry has been established are the main sources of supply for the Commonwealth. Experiments with bananas have been carried out in the North with a view to developing types suitable for the conditions in that part of the State; and the satisfactory results obtained have stimulated an extension of banana growing on our Northern littoral. There is room for much greater development, and this fact is recognised by, and is receiving the attention of, officers of the Fruit Branch.

Agricultural Experiment and Research.

FARMERS are appreciating more the value of experiment and research, for which such stations provide the facilities and the service, and are realising that this work affords the only sure means by which they can travel with any degree of satisfaction along the rough and often disappointing road of hard experience.

The establishment of boys' and girls' pig and poultry clubs, in co-operation with the Department of Public Instruction, also claimed attention in the course of the year. This movement has been marked by much enthusiasm among club members and their parents and teachers, and already it has produced some practical results. It expresses in a very useful way the advantage of keeping the young people on the farm in touch with the best in rural life and of developing natural qualities of leadership, responsibility, good citizenship, and community service.

Agriculture generally throughout the State is showing evidence of healthy progress, and the reports of the several branches of the Department will serve to indicate the systematic development of agriculture and stock-raising in Queensland.

The prospects for the coming year are promising. Winter rains have been general over the agricultural districts, and a good germination has been secured for plantings of root and fodder crops. Grass is plentiful in the coastal and nearer inland areas.

A Healthy Virile Race in the Tropical North.

WRITING to the British Medical Journal, London, in reply to a published letter by Dr. Andrew Balfour, Sir James Barrett, of Melbourne, gives some information regarding tropical Queensland. He quotes figures of the Commonwealth Statistician (Mr. C. Wickens) showing that in 1921 the Italian-born population within the tropics represented 8.37 a 1,000, and south of the tropics 0.56 of the total population.

"It should be remembered," he adds, "that the State is divided into tropical and non-tropical Queensland. The distinction is arbitrary in one sense, as it is based on the Tropic of Capricorn, whereas the whole of Queensland is north of the 29th parallel. From Mr. Wickens's statement it will be seen that the answer to Dr. Balfour's suggestion that the white race in tropical Queensland is of Italian origin is that it is not correct. A healthy white race which is not Italian has been reared in tropical Queensland for several generations. The infantile and the adult death rates are lower than in almost any other place in the world, and the most thorough physiological investigations have shown no deterioration which can be measured by the means at our disposal. Towards the end of his letter Dr. Balfour refers to the low-lying littoral of tropical Queensland. Might I suggest that whether a country is low-lying or hilly tells us very little? It is the accurate record of the wet-bulb temperature that indicates the stress to which human beings are subjected. What may lie in the future I do not know, but I can definitely state that in tropical Queensland a vigorous white race, which contains only a small percentage of Italians, is being reared, and shows no signs of deterioration. In fact, the suggestion that there is deterioration, when made to some of the residents in tropical Queensland, is received with ridicule. Those who saw the soldiers Queensland sent to the front

Bureau of Sugar Experiment Stations.

OUTBREAK OF "WIREWORMS."

The Assistant Entomologist (Mr. A. N. Burns) stationed at Mackay has submitted the following report for the month ended 12th October, 1928, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Severe Occurrence of Wireworms (*Elaterid* sp.) at Te Kowai.

During the latter part of last month attention was drawn to a serious outbreak of "wireworm" injury to young plant cane (Q. 813) at Te Kowai. A thorough inspection of the affected cane was accordingly made, and of the whole of the block, which comprised $6\frac{1}{2}$ acres, fully 4 acres were completely destroyed. The field for the most part was fairly level, but the damage was greatest in the lowest and most poorly-drained portions. The soil was uniform greyish-brown sandy loam, and was very well worked, despite the very dry weather, and it contained a fair supply of moisture at the depth of the cane sets.

In places where the damage was most severe, about one set only in every dozen had survived and grown, some others had sent out shoots a few inches long, but they had been eaten below ground level, and in other cases the eyes had been destroyed as they were germinating. In many instances the wireworms had left the dead sets and moved along to others, and, in almost every case one wireworm only was found at each set. The plant itself was not bored into at the ends, nor were the roots eaten; the point of entry by the wireworm was invariably through a shoot or eye. In the case of the former, the interior was generally tunnelled out in the underground portion. The set or plant in many cases was injured only near the point of attachment of eyes or shoots, where the wireworms had "ringnecked" round it, following the junction of the internode nearest the attacked eye or shoot.

An adjoining block of H.Q. 426 had occasional sets destroyed here and there, but the injury was negligible, and, being a good "strike," this block showed up in marked contrast to the affected cane alongside.

The wireworms were identified as being larvæ of a species of the true *Elaterid* or "click" beetle type, and were of the flattened form of larva. They much resembled small larvæ of the large predatory *Elaterid*, *Agrypnus mastersi*, Pasc. In length they measured approximately $\frac{3}{4}$ inch; the body is of a pale yellowish-cream colour, broadened laterally, giving a slightly flattened appearance; head dark reddish-brown; anal segment bearing a depressed plate, pale-brown.

Specimens were brought back to the laboratory, where they are being bred through to the beetle stage. They are voracious feeders, and are able to move very rapidly through the soil.

Prior to planting the cane in the above field, a crop of Mauritius Beans was grown on the land, and ploughed in. Owing, however, to the excessively wet weather of last February and March, the grower stated that the crop of beans was not nearly so heavy as he had anticipated. Had they been heavy when ploughed in, the subsequent damage from these wireworms might have been reduced a good deal. The ploughing-in of a leguminous crop has been recommended as a help in preventing outbreaks of these pests; the amount of organic matter added to the ground being food for the wireworms, and practically sufficient to sustain them without attacking the growing cane. The above crop of beans being poor might possibly have partially been the cause of so severe an outbreak, especially when combined with the abnormally dry weather at present being experienced, the wireworms having exhausted most of the organic matter in the soil of the affected area, and also seeking moisture.

Frenchi Cane Grubs Pupating (*Lepidiota frenchi* Blkb.).

Grubs of this beetle are now mostly all transformed into pupæ, the majority of those breeding at the laboratory having undergone the change a little over a week ago. The actual period spent in the pupa is comparatively brief when compared with the time spent by the grub in its pupal cell before actually pupating. This latter period has, in many instances, lasted as long as four months, whereas the pupal period occupies normally slightly less than a month. Now that there has been an opportunity of working out the larval stages of this cane beetle in the Mackay district, the two-year life cycle may be divided up as follows:—Eggs deposited by beetles usually about December. Between two and three weeks elapse before the young grubs emerge in the first stage. The time occupied in this instar is variable.

but is usually from about January till May; some grubs, however, were still in the first stage late in June. Second-stage grubs occur from about July to October; at the time of writing some grubs are still to be found in this stage. The periods of time spent in the different stages overlap a good deal. The third and final grub stage is generally reached about November, from when the grubs continue to feed until May. They then burrow deeper down into the soil and form their pupal cells, the remaining time before emerging as beetles being spent as abovementioned in the prepupal and pupal stages.

Greyback Grubs also Pupating (*Lepidoderma albohirtum* Waterh.).

Third-stage grubs of this notorious beetle are also at present undergoing the change into pupæ, and, in the majority of cases, about two weeks later than those of *L. frenchi*. This, no doubt, accounts for the latter species occurring on the wing in the Mackay district slightly earlier than the greyback, which, in the Cairns and other far-northern districts, usually appears just in advance of *L. frenchi*.

All the stages from the egg up to the pupa of this beetle have now been bred at the laboratory, and the following data regarding the times of occurrence of each stage have been gathered. Eggs laid by beetles in December and early January (in ordinary seasons), grubs in the first stage from January to about the middle of March, in the second stage from late February till April, and in the third stage from April till October. Not nearly so long a time is spent by *albohirtum* grubs in the prepupal stage as is the case with *L. frenchi*. Specimens now pupating were active and feeding in July and even August, which makes the "resting" period before changing into pupæ in the pupal cells about two months—just half as long as that of *L. frenchi*. The pupal stage occupies approximately four weeks, and the newly-emerged beetle remains in its cell for several weeks, or even months, if the weather be very dry, before finally emerging from the soil. The emergence from the ground of the beetles is controlled by the advent of the first soaking summer rains; the beetles generally appearing a day or two after these. Should a prolonged dry spell occur, however, emergence is retarded, and very frequently numbers of beetles perish in their cells, being unable to escape owing to the hardness of the ground.

Dasygnathus Beetles now in Cells (*Dasygnathus australis-dejeani* Blkb.).

Beetles of this species are now present in numbers in their cells, doubtless awaiting the first early rains to enable them to escape from the soil. A large number of third-stage grubs were collected during last March and April from canefields; most of these pupated about the middle of August, making the duration of the third-grub stage about five months. On an average from six weeks to two months is spent in the prepupal state, and some three weeks only in the actual pupa. Many of the beetles bred at the laboratory have quite "hardened," and no doubt an emergence of this species will take place immediately following the first rains. The weather during the past five months has been exceptionally dry, and, in consequence, the ground in many places has become extremely dry and hard. Abnormally dry conditions such as these would probably tend to slightly lengthen the period of development of pupæ in the soil, so that it is probable if rain had fallen recently there would have been a primary emergence of this beetle.

CANE PESTS AND DISEASES.

Mr. G. Bates, Assistant to Entomologist at the Sugar Experiment Station, Bundaberg, reports for the period July-August, 1928:—

Effect of Sorghum on Cane Grubs.

In the course of investigations the theory has often been advanced by growers that the ploughing-in of young sorghum will kill any grubs that may happen to be in the soil. This impression, no doubt, originated in the fact that sorghum, when young, contains hydrocyanic acid. This is a deadly poison and is frequently responsible for deaths among cattle that have chanced to eat a small quantity of young sorghum, but the idea that it will kill grubs is quite erroneous, and has been clearly demonstrated in both the laboratory and field.

Mr. E. Jarvis, Entomologist of the Bureau, carried out laboratory experiments in this direction in 1921 regarding the effect of poisonous plants on cane grubs, and among other things young sorghum was given a trial. Results showed that grubs "were not injuriously affected, but, on the contrary, appeared plumper and more

Regarding field tests, opportunity has been afforded us to witness a trial carried out by a grower in this district on land subject to grub attack. Desirous of planting a crop for green manure, and having heard of instances where the ploughing-in of young sorghum has been credited with killing grubs, he decided to conduct a trial, thinking that perhaps the southern grubs being of a different species from those of North Queensland, the results may be somewhat different. It was therefore arranged that, when planting, a strip would be left bare so as to provide a check plot.

This block was ploughed in December, and although rather old the sorghum was still in a condition that would kill stock if they chanced to eat it. This land was ploughed again in February and April, and on both occasions young sorghum was turned under, this being a volunteer crop, the result of wet weather preventing the stools being entirely killed during previous cultural operations. The land was given further cultivation during August, and on each occasion when ploughing, grubs were found to be numerous and quite healthy.

This field test merely confirms the laboratory experiments—that ploughing-in young sorghum will not exercise any control over cane grubs.

Rats.

Reports of damage by rats in canefields in this district have recently been brought under the notice of this Experiment Station, damage occurring on some low-lying country close to the river.

The damage caused by rats is familiar to most growers, and is often of a serious nature. Various poisons have been recommended for the control of these pests, such as strychnine, phosphorus, arsenic oxide, and barium carbonate. In Hawaii, where rats were doing extensive damage, the best results were obtained from the use of barium carbonate biscuits, and good results have also been obtained from this poison in North Queensland.

In one instance which came under our notice, both Q. 813 and H.Q. 285 were being damaged, and as the loss was appreciable and likely to become worse, it was recommended to poison with barium carbonate biscuits. This was done, and a fortnight after spreading the bait an inspection showed very little fresh damage, the old damage being recognised by the eaten portions being dry and red, or else dried up altogether and brown. This field was examined a second time three weeks after spreading the poison, and in only one part of the field was any freshly eaten cane found. This consisted of only three sticks, located where the damage was worst. Very little cane was freshly damaged compared with the amount seen when spreading the poison. This result is extremely satisfactory, and any grower who is troubled by rats is advised to give this method a trial.

The following formula was the one used, and is identical with that used by the Mulgrave mill, to whom we are indebted for particulars concerning their use of this poison against rats:—

Barium carbonate	..	..	..	..	..	10 $\frac{1}{4}$ lb.
Flour	..	..	..	..	..	21 $\frac{1}{4}$ lb.
Pollard	..	..	..	..	..	4 lb.
Tallow	..	..	..	..	..	6 lb.
Salt	..	..	..	..	..	9 $\frac{1}{2}$ oz.
Water	..	..	..	..	..	5 $\frac{1}{2}$ pints
Aniseed oil	..	..	..	..	..	$\frac{1}{4}$ oz.

Mix the barium carbonate, flour, and pollard dry. Melt the tallow and mix in roughly. Dissolve the salt in the water and add slowly, making the whole into a stiff dough. Roll out to a quarter of an inch thick, cut up into pieces $\frac{1}{2}$ inch by $\frac{1}{2}$ inch, and bake until dry. Then mix the aniseed oil with an equal quantity of water and spray over the biscuits. The bait is then ready for use. It is advisable to handle the biscuits as little as possible, and to rub oil of aniseed on the hands when putting out the poison. This mixture is both cheap and effective, and has the further advantage of not being highly poisonous to stock, fowls, dogs, and humans, although only a small quantity is required to kill a rat. Barium carbonate can be purchased for 1s. per lb., and the other ingredients are also inexpensive. Made up in this manner, one-third of a biscuit will kill a rat; so that the quantity to spread per acre will naturally depend on the number of rats in the field. Scatter six biscuits every 5 yards along headlands, edges of creeks, &c., where rats are harbouring, and walk through the cane along every twentieth row scattering bait at the rate of six every 10 yards. This is only a guide, as rats may be damaging cane in only one corner of the block; so that no hard-and-fast rule can be laid down, and the quantity put out must be left more or less to the discretion of the person using the poison.

Furthermore, for the efficient control of rats, places which harbour them, such as dirty headlands, creeks, and gullies, should be cleaned up and not allowed to remain as a breeding ground.

RESISTANCE OF VARIETIES OF SUGAR CANE TO DISEASE.

Mr. A. F. Bell, who is in charge of the pathological investigations of the Bureau of Sugar Experiment Stations, states that after consultation with the Pathologist to the Colonial Sugar Refining Company in New South Wales (Mr. D. S. North) it was decided to use the following four classes to describe the relative resistance of any cane variety to disease:—

A. Commercially Immune.

This class includes those varieties in which the disease has never, or only very rarely, been observed, although such varieties have been exposed to sources of infection over a period of years.

B. Highly Resistant.

Varieties in this class can be grown in the presence of the disease without any precautions.

C. Moderately Resistant.

Varieties in this class can be grown in the presence of the disease, provided that suitable precautions are taken.

D. Susceptibility.

It is unsafe to grow varieties of this class in the presence or vicinity of the disease, in spite of the exercise of all reasonable precautions.



DIVISION OF PATHOLOGY.

The Director of the Bureau of Sugar Experiment Stations has received the following report upon the work of the Division of Pathology during the month of August, from Mr. A. F. Bell, Pathologist:—

Cane in Private Gardens.

Arrangements have been made to grow a number of varieties of Queensland cane in isolation in private gardens in Brisbane. One variety will be planted in each garden, and these will be inspected periodically, and if found to be healthy will supply a nucleus of clean seed for the proposed variety garden.

Distribution of Gumming Resistant Canes.

Under the supervision of this division, small parcels of S.C. 12/4 and B.H. 10/12 have been sent to selected parties. The recipients of the canes have been asked to grow them in isolation in order to propagate disease-free stocks.

Gumming Resistant Trials.

I spent some two weeks in the Bundaberg district, inspecting farms in order to get disease-free seed for the purpose of laying out a gumming resistance trial at the Bundaberg Experiment Station. The following varieties have been included:—Oramboo, Nanemo, Korpi, B.H. 10/12, S.C. 12/4 P.O.J. 2714, Q. 813, Q. 812 A, Uba, Badila, M. 55, Co. 210, Co. 213, Co. 227, Black Innis, 1900 S., D. 1135, and Assam Red. Two plots of two rows of the first four varieties, and four plots of the other varieties have been planted out, the standards being 1900 S., and D. 1135, each variety being in contact with both standards.

Yield Trial.

A yield trial of the gumming resistant canes Co. 210, Co. 213, and Co. 227, was laid out with Q. 813 as standards, there being four repetitions of each variety.

Meetings.

Three meetings of farmers were addressed by me while in the Bundaberg district, and particular emphasis was placed on the need for isolation nurseries. I also met the district executive and discussed this matter; they have undertaken to circularise farmers with a view to finding suitable locations for clean seed nurseries.

Mr. Kelly also addressed a gathering at Mulgrave.

Sectional Chlorosis and Tangle Top.

Sectional chlorosis is very common all over Queensland this year, and particularly so in the Bundaberg area. Several cases were recorded where the collapse of the leaves, following sectional chlorosis, had caused tangle top, and ultimately, in some cases, the death of the cane. An article for publication will be prepared on this subject in the near future.

Applications for Permits to Sell Seed.

A number of applications for permits to sell seed have been received from growers on the Gayndah line. A good deal of inconvenience is caused in making separate visits to these localities, and next year it may be necessary to control the time of application somewhat.

Badila from Wolvi.

The chemist in charge at Bundaberg made arrangements to receive a small crate of Badila from Mr. J. H. Thornton, of Wolvi. This cane will be planted on the Station, and observations made on the time elapsing before it becomes infected with gumming.

Lake Barrine Nursery.

This was inspected on 11th July and 6th August, and no trace of disease found, although the cold weather has been responsible for slow growth, and army worms are proving troublesome.

MOSSMAN DISTRICT.

The district survey was completed by Mr. Kelly on 3rd August. Leaf Scald was found on practically all of the farms inspected, the most commonly infected variety being H.Q. 426. Suggestions were made that an isolation nursery should be started in the Daintree district. Leaf Stripe was seen wherever B. 147 was grown, and was also occasionally seen in D. 1135, Pompey, Q. 813, Badila Seedling, M.Q. 1, Badila, N.G. 24, and M. 55/1182. Scattered cases of Red Rot were noted. Spindle Top was noted, chiefly in Badila, and in most instances, was directly traceable to injury by pests.

GORDONVALE DISTRICT.

The inspection of this district was completed by Mr. Kelly on 25th August, and the following is a summary of the diseases found:—

Farms inspected	..	..	42	Gumming	..	..	1
Leaf Scald	..	..	42	Spindle Top	..	..	28
Leaf Stripe	..	..	1	Red Rot	..	..	3
Mosaic	..	..	4	Rind Fungus	..	..	1

Special visits were also made to a number of farms when the source of seed suggested that they might have cane infected with Leaf Stripe or Mosaic.

Canes which had recently been imported from southern districts were also inspected for possible gumming, but were found to be free.

The area in which Mosaic has been found will be reduced from 89 to 50 acres this year.

The H. 109 at Aloomba, in which gumming was found, is dying from this disease in places; this cane and the adjoining Badila are to be ploughed out next month.

Mr. Kelly also reports the successful use of the barium biscuit in combating the ravages of rats.

MARYBOROUGH DISTRICT.

During the month, farms which were expected to be relatively free from diseases were given a final inspection, and a long list of permits granted; these have already been published in suitable channels.

The final figures showing the distribution of disease are as under:—

Place.	Number of Farms Visited.	Mosaic.	Gumming.	Fiji.
Walker's Point	12	2	..	4
Island Plantation	46	14	1	12
Prawl, Dundathu, Pialba Road	11	2	..	1
Mungar, Antigua, Oakhurst, &c.	19	11	..	6
Lindah, Eton Vale	18	10	..	5
Nerada, Tinana, from Bridge	17	8	..	10
Teddington Road	13	2	..	3
The Pocket	5	1	2	4
Queen Street	6	1	..	6
Granville	9	2	..	6
Magnolia	23	15	..	13
Gympie Road	17	3	..	3
Totals	196	71	3	73

NAMBOUR DISTRICT.

During the inspection of this district, fifty-seven farms were visited, and practically all found to be infested with gumming, twenty-five with Mosaic, and four with Fiji. The percentage of Mosaic is low, averaging less than .5 per cent. on the infected farms, and as farmers are roguing, the position is not serious. The reason for the outbreak of Fiji disease is still a mystery, but the disease is not widespread. The gumming situation is bad, and requires the establishing of nurseries of clean seed in order to control it. Q. 813 is showing practically no trace of gumming and is doing well on the higher river soils, but is not adapted to wet conditions. Badila,

H.Q. 285, N.G. 16, and D. 1135, are rather badly affected. Uba does not appear to be suited to many parts of this district. One farmer (J. Blanche) has a few stools of P.O.J. 2714 which appear to be doing well, although planted in a swampy patch.

Clean Seed for Nambour District.

In response to a request from the Secretary of the Nambour Cane Growers' Association, Mr. Wood was despatched to the Pialba district to make the necessary inspection of farms. The secretary was advised that permits had been issued to the following growers:—Messrs. O. Wendland, R. Wood, O. Moes, Nikenbah; —. Cadell, Kawungan; and J. E. and R. Cormie, Box 10, Pialba.

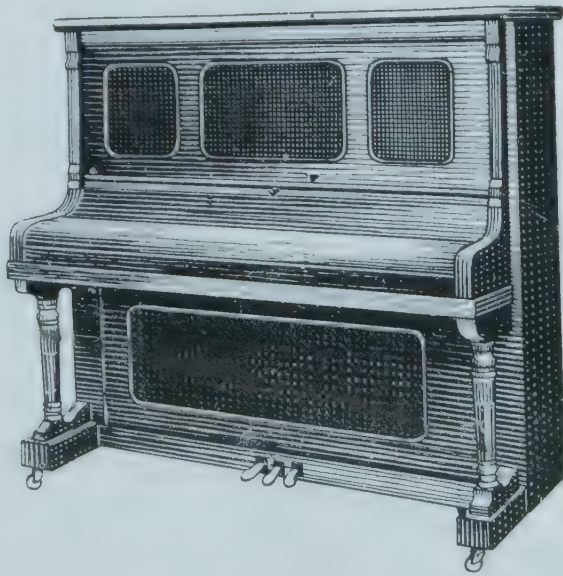


PLATE 114.—SPECIMENS OF S.C. 12 (4) FIRST RATOONS (12 MONTHS OLD) GROWN IN BOTANIC GARDENS FOR SUGAR BUREAU.

In the picture are Mr. H. T. Easterby, Director of the Bureau of Sugar Experiment Stations and Mr. Ferguson Wood of the Bureau Staff.

This cane was received by the Bureau of Sugar Experiment Stations in 1926 and planted in quarantine in the Botanic Gardens.

The photograph is of first ratoons, twelve months old. This cane is highly resistant to the gumming disease in Porto Rico, and was imported for the purpose of trying it in this respect in Queensland.



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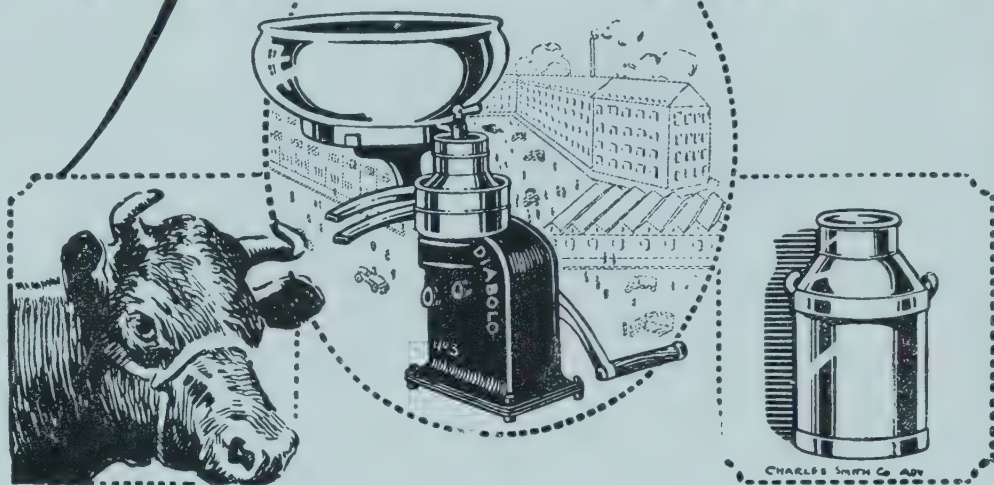
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FIELD REPORTS.

The Northern Field Officer, Mr. A. P. Gibson, reports (13th September, 1928):—
TULLY.

Weather.

The total absence of rain and higher day temperatures during the last two weeks mark the real commencement of summer.

Fifty-three inches of rain were recorded at Ingham to the end of August. Tully, some 58 miles northward, registered 122 inches for the same period; 4.70 inches fell during the month of August.

Progress.

The progress of the industry here has been rapid, and may be judged by the extraordinary growth of the town and district. What was great scrub country a few years ago is now an immense canefield, dotted with homes and intersected with roads or railroads, and has a very modern telephone service.

Soils.

The future wealth of this district depends entirely on sugar—the one big product—and the richness of its soil. Here it is alluvial and varies much in colour, depth, quality, and texture, as most other water-formed soils do. The more fruitful soil is to be found back at various widths from the River Tully and the lesser creeks. It seems unfortunate that some upland country has been bared of its dense vegetation and planted to cane when there is ever so much more superior level land. The soil differs on this rough country; it is coarse grained and reddish in colour; such hilly country is always more costly to cultivate and harvest, and is also responsible for much truck wrecking and a probable rainfall reduction. Some parts of the world are striving to cover with vegetation their bared heights, mainly with the object of increasing the rainfall.

The Crop.

About 99 per cent. of the crop is Badila (N.G. 15); it is expected to yield in the vicinity of 225,000 tons, and is cutting satisfactorily. Upwards of 70 tons per acre have been cut in places. Cane grubs, abnormal tasselling, and much spindle top are factors responsible for a diminished yield in other parts. Despite these reducing mediums, the grand crop summary will probably over-shadow the record by some 20,000 tons.

Harvesting.

Perfect weather conditions prevail for this class of work. Generally speaking, the harvested cane is very dirty. Improper ground cutting was noted.

Milling.

The mill is not so far advanced with its crushing as might be expected owing to time being lost by a strike and an inadequate cane supply at times. Much burnt cane was being milled when the area was inspected—the reported results of many big accidental or mystery cane fires. The dry weather has permitted speedy cane ripening. Last week the mill average was 14.72 per cent. c.e.s.; the seasonal average is slightly under 13 per cent. c.e.s. About 119,000 tons had passed between the crushers to the 15th September; this is over the half-way mark.

Sugar storing has been made compulsory owing to the water-front trouble. Sugar storing means extra handling, which increases the cost of manufacture, and also helps to lower the quality.

Fired Cane.

When cane is fired, its cells perish; they cease functioning, cane weight is reduced, and, if it is not immediately milled, quickly ferments. This, together with improperly harvested cane, considerably reduces the factory efficiency. Farmers should endeavour early in the season to harvest such fields that would serve as handy fire breaks, thus reducing the possibility of big fires. They should also safeguard the areas more by paying greater attention to burning stumps and logs.

Varieties.

Badila is the major cane grown. A small percentage of H.Q. 426 is planted to fill in the gaps, mainly because it is a good germinator and a speedy grower. Some Korpi and 7 R. 428 were noted. A few stools of the Hawaiian cane, H. 109, were seen. Out Syndicate way this looked well; the stems were fully 12 feet long and very straight, standing much higher than the Badila growing round it.

Cultivation.

More land annually is made ploughable by the removal of stumps, roots, and logs. Tractors, fires, and explosives are wonderful helpers in this class of work. Drawing logs together or completely removing them from the field minimises considerably manual labour of the back-breaking type, for it permits the use of animal-drawn light implements, which, when timely used, reduce hoeing and subsequent harvesting rates, and also permit soil sweetening. Some "hurry-up" tilling was noted; several farmers had actually replanted between the old stubbles. Others have ploughed out badly the cane stools cut this year and immediately replanted; some of the old stools were growing again among the new germinating crop, or lay thickly strewn over the surface, which must naturally hinder all subsequent interspace tilling. When these are removed from the field and not ploughed under, soil humus is reduced considerably.

Planting.

Spade holing for planting the first crop is usual. Rag-topped alignment and row-spacing sticks some 12 feet long are placed 5 feet apart and distant 3 or 4 chains. It is advisable to sink cane holes 12 inches by 8 inches by 8 inches and 24 inches by 30 inches apart. Good disease-free seed only should be placed on the loosened bottom soil in the hole and the plant lightly covered. It is common here to see inferior seed placed on the hard pan of too small and shallow a hole; small wonder that many of the Tully canefields have to be renewed before their time. High ground cutting, especially the plant cane, is a tragedy; this, coupled with improper drainage and shallow planting, is responsible for much spindle top and some poor ratoons.

Ploughing.

This at all times should be thorough, and the depth regulated according to the quantity of surface soil. Too deep ploughing in some soils is detrimental rather than beneficial.

Weeds.

Commonly known as blue-top, Commonwealth, and Ink weed quickly grow in profusion immediately after scrub firing; every endeavour should be made to control these before they seed.

Manuring.

It seems obvious that most of the land here will require heavy feeding to keep it fruitful. The price of fertilisers, combined with some low cane prices (the result of surplus sugar), will doubtless have the tendency of putting out of action for cane-growing a percentage of the less fertile land, or some fields growing Badila to-day will be called upon to produce instead a more profitable kind. There is, however, an abundance of surrounding good land, more of which will be wanted in the near future to make good the diminished supply. Owing to the newness and varied nature of the soil, it is difficult to advise with any degree of certainty the most profitable manure to apply until some soil analysis and field trials have been conducted. Nitrogen apparently is wanted. Lime would improve the cohesive ill-drained soils, but its price almost prohibits its use. Humus should be maintained; much surface mould is lost when the fallen scrub is burned. An abundant supply of humus in the soil improves its texture and arrests plant food leaching during periods of excessive wetness.

Yellow cane leaves were noted in isolated patches of new ratoons, apparently due to the lack of plant foods.

Drainage.

An improved system is urgently required on the shallower soils overlying an impervious sub-strata. When the soil becomes super-saturated with water and remains so for any length of time, cane roots perish. The anchorage is reduced and the crop suffers, even falls.

Pests.

The environment is most suitable for the rapid increase of rats. Grubs have been responsible for greater losses than is generally thought. Wallabies and wild pigs are numerous, and have occasioned damage in isolated spots. Army caterpillars have in some fields devoured most of the crop foliage, in some instances, not even leaving the leaf mid-rib. *Pentodon australis* (a black beetle) and larvæ of the tineid moth were found destroying some lesser plant and ratoon shoots. Weevil borers were noted in harvested cane coming from the settlement.

1929 Prospects.

It is yet too early to predict what the ensuing harvest will be. At the moment the stand of cane (save parts) is patchy and lacks a dark-green colour, suggesting that nitrogen is wanted. Its general appearance is less favourable than the present one was at the same time last year.

Unmanured cane in the area seemed to have tasselled most. It is known that manuring and irrigation have arrested arrowing in the territory of Hawaii.

The Northern Field Assistant, Mr. A. P. Gibson, has submitted the following report on the Herbert River Sugar-cane producing area, inspected 14th to 30th August, to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby):—

HERBERT.**Weather.**

High day temperatures and cool nights have been the rule. The main feature of the month is the scanty rainfall. Earlier in the year parts of this big agricultural district were favoured with some beneficial rain, but very little has fallen during the last four months. A good general fall is urgently needed to replenish the now depleted surface water supply, also to freshen the parched vegetation.

Rainfall.

				Ingham.		Halifax.
				Inches.		Inches.
January	..	..	..	7.29	..	6.27
February	..	..	..	31.45	..	27.56
March	..	..	..	6.89	..	10.11
April	..	..	..	2.93	..	1.29
May	..	..	..	1.17	..	0.84
June	..	..	..	2.14	..	2.54
July	..	..	..	0.73	..	1.14
August	..	..	..	0.64	..	0.18
				53.24 inches.		49.93 inches.

Progress.

This area is recognised as one of the best in Queensland. The district and town have made extraordinary progress despite the great setback of the 1927 record flood.

The present crop is the largest yet experienced, so far as tonnage is concerned. The green foliage of the matured crop, especially that of variety H.Q. 409 is heavily blanketed with a fading brown mass of feathery tassels, the fuzz from which is tumbling fast. The large crop is mainly due to the increased area planted to cane, the abnormal amount of plant, and a subsequent favourable season.

Harvesting and Milling.

Up to the present the weather has been very suitable: consequently, operations in field and mill have proceeded uninterruptedly and with amazing speed. Some varieties have tasselled more than ever before, and now possess large stem side shoots which are gradually reducing the weight of the cane, and increasing the cane-cleaning difficulties. The district is panning out in the vicinity of 20 tons per acre. Tractors

are largely used for hauling the loaded cane trucks over portables from field to permanent way. It is pleasing to the farmer to find his crop harvesting heavier than was estimated. Practically all the cane being milled is unburnt, and, owing to the absence of high winds, is straight, lengthy, of excellent appearance, and wondrously clean. Many years have elapsed since the writer has seen better harvested or cleaner cane than that coming forward to the Victoria mill; its condition is a credit to those responsible. Clean cane is very desirable and helpful for efficient mill work.

The two factories are both working to their fullest capacity, making good progress considering the size of their crushers. The record crop estimated at 477,000 tons is being reduced by 15,500 tons weekly. If this remarkably high weekly rate is continued, the district's greatest crop will be fully milled by the end of the year.

Estimates, and some Factory Particulars.

Mill.	Estimate.	Cane Milled up to 26th August.	Greatest Tonnage Crushed per week.	Per cent. of Clean Cane.
	Tons.	Tons.	Tons.	
Macknade ..	225,000	128,000	8,326	96.3
Victoria ..	252,000	110,000	7,415	97.7
	477,000	238,000		

Half the estimated crop has been crushed. Macknade has averaged 8,000 tons a week since starting; Victoria, during the last eight weeks, has averaged over 7,000 tons. Two very old beam crushing engines at Macknade (Darby and Joan) must be giving efficient service. This mill will probably complete its assigned cane about the end of November, after which it may assist its sister mill to finish.

Cultivation.

The weather being favourable, ratooning, ploughing, planting, and interspace tilling are being hurried along. Most of the cane is hand planted. Poor plant germination has occasioned extra work in filling the great gaps among the plant cane. The work in nutgrass fields has to be continued until the foliage covers the row. In some instances tractors are working day and night, immediately ploughing out exhausted stubbles and planting. This is bad practice on the soil and industry at present. It is difficult to get the farmers to grasp the great value of seed selection. Throwing whole canes into cane drills and cutting to lengths as they lie is not plant selection. Eyeless canes, the result of rats, larva of the bud moth or a careless harvester were noted lying in drills where this type of planting was being conducted. H.Q. 409 is obviously a popular variety for the wet shallow lands. This kind tasselled some weeks ago, and is now carrying great side shoots. These have reduced the top 14 inches or more of affected canes to pith and rind, and must, if planted, result in a miss. Headland ploughing after the final ploughing, is necessary, yet is too commonly neglected. A furrow made along the sides of the cane rows prior to planting prevents ragged ends, and also improves the field appearance. Earthing up is frequently overdone; this is a necessary evil and is done to a greater extent in nutgrass land to smother the thick weed growth surrounding the young cane. A bit of new road land recently cleared of guava and burr was planted to cane with the rest of an adjoining field at Halifax. This forged ahead of the rest, and when seen was outstanding in colour, growth, and stooling.

Varieties.

The major varieties grown in the area are as follows:— Badila, H.Q. 409, Korpi, Oramboo, Nanemo, and Q. 813.

Fertilisers and Drainage.

Lime is indispensable to the growth of cane; more of it and a better drainage system would improve the mechanical condition of the soil on many local farms. Large quantities of manure are applied to plant and ratoons annually, and at rates varying from 2 to 5 cwt. per acre with reported beneficial results.

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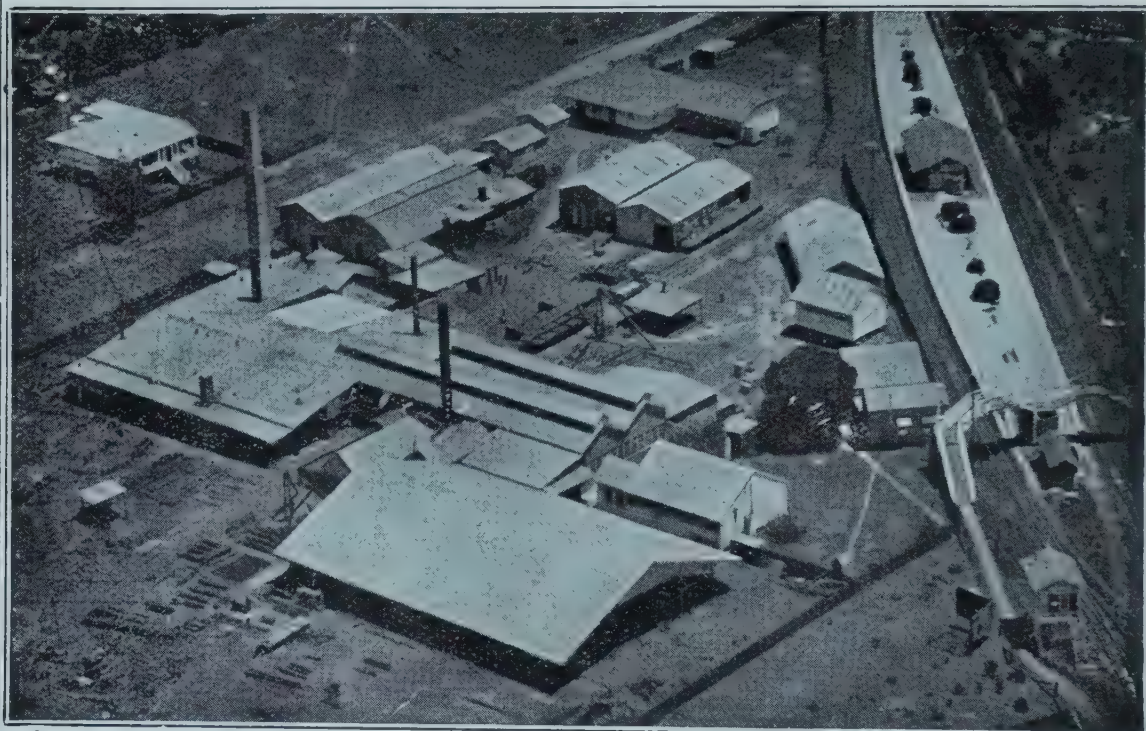
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Dominant Weeds.

Much vacant land is being rapidly covered with a rampant growth of burrs and guava; over-wide roads are responsible for its spread. Nutgrass and guinea grass continue to spread. Real Johnson grass is to be dreaded in the cultural lands and should be controlled where possible. One farmer claims to be keeping it down by the timely use of the scythe.

Pests.

The most serious cane enemy here is the field rat; the district's environment is highly suitable for its increase. The need of doing something to control this pest is becoming more pronounced. As the season advances crop destruction must increase, due to the fact that the enemy is being continuously driven from the cut to uncut fields. Rats nest mainly in the ground or about a foot off it in the cane stools. The main injury is the devouring of eyes and the internodes to such a degree that the stem breaks off. This diminishes the sugar content and weight, and increases harvesting costs. Clean field surroundings and the use of poison baits have been successful in controlling this pest. The barium carbonate biscuit has proved effective in the Territory of Hawaii, and also in Queensland areas. Three pence per rat tail is being paid in some parts of the district.

Shoot Killers.

Pentodon australis (a black beetle) larvæ of the tineid moth and big moth borer, also some grubs, were noted.

Foliage Eaters.

During a dry time wallabies are more destructive, and army worms damage the crops.

A judicious attempt is being made to arrest the big river bank erosion on the seaward side of Halifax. A pile-driver is driving red mangrove piles about 24 feet by 6 inches closely together in the soil along the exposed bank.

SAN JOSÉ SCALE.

F. L. JARDINE, Inspector of Diseases in Plants.

One of the most deadly enemies of the fruitgrowers of the Granite Belt is the San José scale, and, though this small insect is rather hard to detect in its earliest stages of infestation, if it is left unchecked it very soon establishes itself to such an extent that it may well be termed one of the worst tree killers to growers of deciduous fruits.

To those growers who are fortunate enough not to have this scale in their orchards and also to those who have not noticed it, it might be as well to point out a few symptoms which may help to detect any trees that have perhaps escaped notice.

The adult insect has a greyish-brown covering, and where a tree is badly infested it has the appearance from a short distance of having been dusted with fine wood ashes; also any tree that shows signs of gumming is well worth investigation, because where San José scale has been left unchecked for a period, gumming of the tree, or the portion affected, generally follows, prior to the dying of the tree or the affected part.

Growers will be well advised, in their own interests and in the interests of their district generally, to make a concerted effort to keep this scale in check and so control a deadly enemy to their trees and an expensive one to exterminate. San José scale can only be fought effectively during the winter months, when oil and lime sulphur sprays can be used at their full strength, and it is then that the orchardist should keep a close watch, and any tree harbouring scale should be tagged or marked by tying on strips of cloth, thus keeping this particular tree under notice.

When the usual winter spraying is in full swing, special attention should be given to the marked trees by giving them a thorough washing, and in cases where the infestation is very bad, two or more good sprayings will be necessary. These may be given at intervals while general winter spraying operations are in progress.

DISEASES OF THE BANANA IN QUEENSLAND.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

IN the early days of the banana industry in Queensland there appears to have been little in the way of disease to trouble the grower. As the industry expanded several maladies came under notice. A few of these, such as Bunchy Top and Leaf Spot, may be considered of a somewhat serious nature, while others such as the fruit rots, Panama and Dry Rot, are for various reasons usually of only minor and local importance. With a view to enabling growers to become familiar with the commoner diseases as they occur in Queensland, there is given in the following pages short descriptions of these, together, where possible, with recommendations for control.

BUNCHY TOP.

Bunchy Top is by far the most serious disease affecting the prosperity of the banana-grower in Queensland. In northern New South Wales and the extreme southern portion of coastal Queensland the once thriving banana-growing industry has, for the time being, been practically wiped out by the ravages of this malady. A similar fate awaits those districts so far free or only lightly affected unless the recommendations designed for the exclusion and control of the disease are strictly adhered to.

The first definite recognition of the presence in Australia of the disease now known as Bunchy Top occurred in 1913. Apparently it was introduced by means of infected suckers imported from Fiji, where the disease had been prevalent for many years. In 1922 the trouble began to assume such serious proportions as to call for special investigation by the officers of the two States concerned. Finally, in 1924, on the recommendation of a Board representing the Commonwealth Institute of Science and Industry and the Agricultural Departments of New South Wales and Queensland, the Bunchy Top Investigation was appointed consisting of Professor E. J. Goddard (Supervisor), Mr. C. P. J. Magee (Assistant Plant Pathologist), and Mr. H. Collard (Horticulturist). The expenses entailed were met co-operatively by the Commonwealth and the Departments of the States concerned. In Bulletin No. 30 of the Council for Scientific and Industrial Research, Mr. Magee has detailed the results of the investigation, and the nature of the disease and its means of transmission are shown to have been clearly demonstrated, with the result that sound control measures may now be advocated.

Symptoms.

The appearance of a typical Bunchy Top plant showing the later stages of the disease is such as cannot readily be confused with any other banana malady. However, for the purposes of prosecuting efficient control measures it is necessary to be able to detect the first visible symptoms of the disease. These can be searched for by holding the lower part of the youngest leaf of the plant so as to look at it from the back with the light shining through. If the plant has become infected there will be noticed short broken lines of a dark-green colour lying between and parallel to the clear veins which run out at right angles to the midrib. The dark streaks are broken up into short irregular lengths so as to resemble the signs of the Morse code. (Plate 115.)

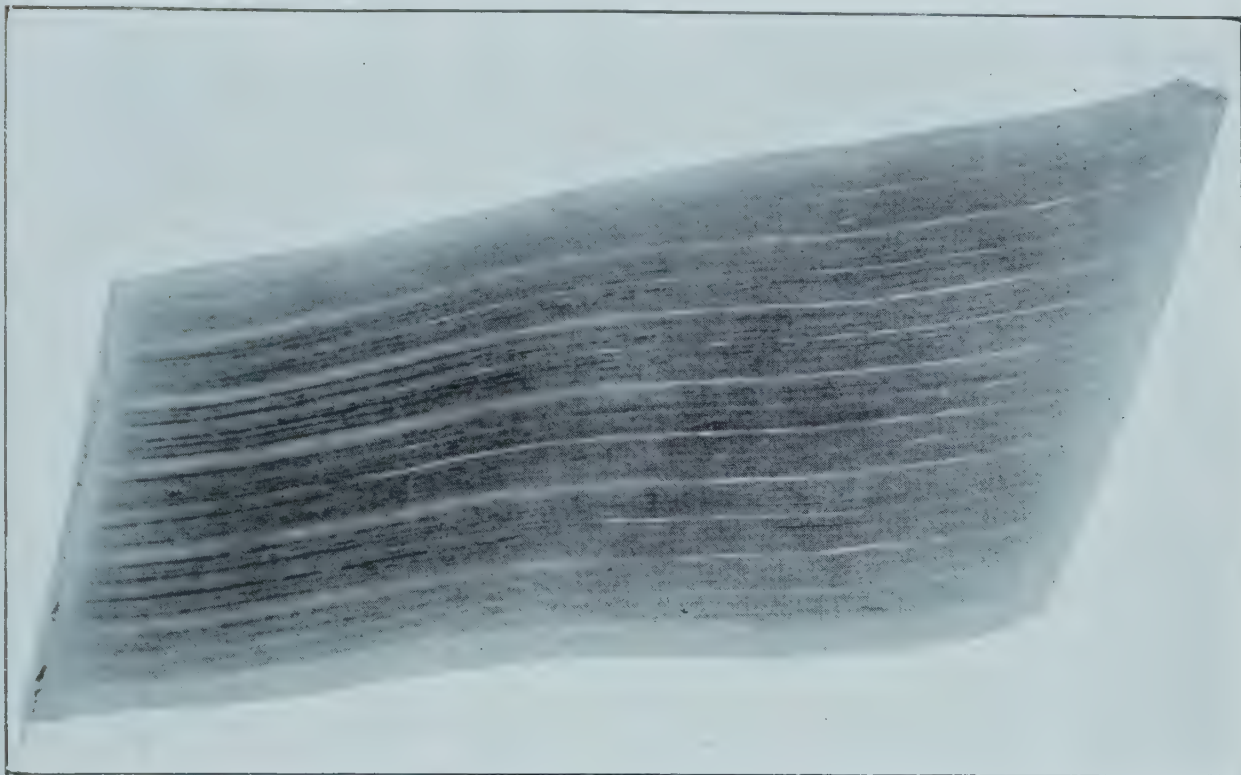


PLATE 115.

A portion from the base of a leaf of a Bunchy Top plant, photographed from the under side by transmitted light, showing the characteristic lines of dots and dashes.

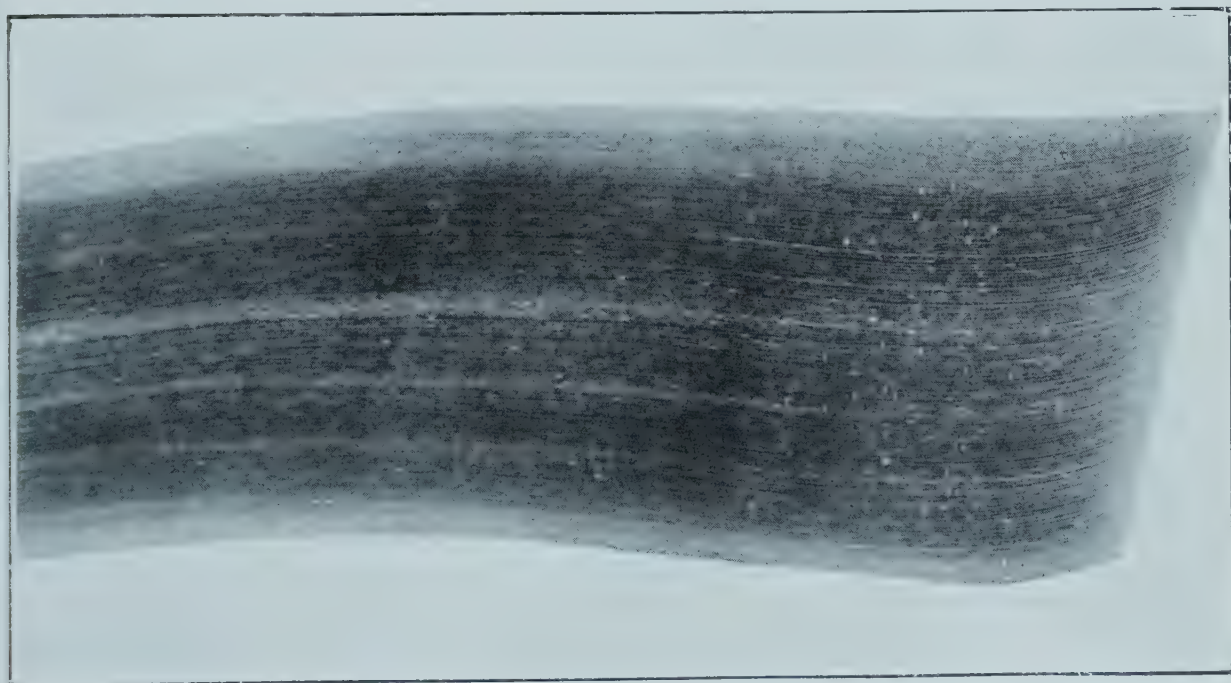


PLATE 116.

A portion of a leaf from a healthy plant photographed in a similar manner to Plate 115.

At first the dots and dashes may be somewhat sparsely scattered, but in the later stages of attack these may be so numerous as to form almost continuous dark-green lines, which give to the affected leaf a somewhat darker green appearance than normal. All the leaves subsequently formed exhibit evidence of the disease and to an increasing extent.

The following additional symptoms usually only appear three weeks or more after the marking just described first becomes visible. Suckers infected from the parent, however, may exhibit them from the start and to even greater intensity. Instead of waiting until it is properly free from the pseudo-stem the newly-thrown leaf will commence unfolding from the top in a funnel-shaped manner. The leaves become reduced in length and width until they are of a somewhat elliptical shape. The blade shows a tendency to droop along the midrib so that the backs of each side approach one another. The edges are rather more wavy than usual and are sometimes slightly curled inwards. Affected leaves exhibit a marked brittleness not natural to the healthy plant. Instead of increasing in size in their order of growth, the leaves of a Bunchy Top plant gradually become smaller. The leaf stalk also fails to elongate and bears the leaf in a more erect manner. The result is the formation of a crown of stiff, narrow, erectly-growing leaves bunched together in a typically rosetted manner. (Plate 117.) A Bunchy Top plant affected in its early stages of growth rarely throws a bunch and when owing to a late infection this does appear it is commonly stunted and possibly malformed owing to the constricted state of the top of the pseudo-stem through which it has to pass.

Cause.

It has now been demonstrated conclusively that Bunchy Top belongs to that type of plant malady known as a virus disease. The various plant diseases included in this type show many general points of similarity, of which the chief lies in the fact that the casual agents are of such minute size that they have so far defied all attempts to view them microscopically. What little is known regarding the nature of the infectious agent or virus concerned in the different virus diseases has been determined by experimenting with the plant juice in which it is known to be present. A virus disease may be transmitted from one plant to another in various ways. For some it is merely necessary to inoculate a healthy plant with the expressed juice from a diseased individual. In other cases grafting of diseased on to healthy tissue becomes necessary. In the more specialised forms the virus is conveyed from plant to plant by means of an insect vector. Bunchy Top belongs to the latter type.

This disease is disseminated by means of the dark banana aphid (*Pentalonia nigronervosa*) which, in pursuance of its normal feeding habits, may first suck the juice of a diseased plant and then migrate and carry out the same process on a healthy one, with the result that the latter becomes inoculated with the virus and so contracts the disease. (Plate 118.) This insect is responsible for the spread of Bunchy Top throughout a plantation and between neighbouring plantations. When one plant contracts the disease the other members of the stool usually become infected as a result of the virus making its way through the connections which link up the various individual corns. Suckers arising from an affected plant almost invariably exhibit symptoms of primary infection from the parent.

Control.

When considering methods for the control of Bunchy Top it is necessary to stress the following points:—

(1) Bunchy Top is a disease of a systemic nature. The causal virus being present within the living tissue of the host cannot be destroyed by any chemical or mechanical treatment known at the present time, other than by destruction of the plant itself. In other words, a plant cannot be cured once it has contracted the disease.

(2) Bunchy Top may be introduced into a clean area by means of suckers infected with the virus which have been taken from a diseased plantation, and also, if centres of infection are not too far distant, by the possible influx of infected aphids.

(3) The disease is spread within an affected area and also the limits of that area gradually extended by (a) the planting of infected suckers; (b) the transmission of the virus from diseased to healthy plants by the banana aphid.

(4) An attempt to eliminate Bunchy Top by complete control of the aphid is beset by so many practical difficulties in the average banana plantation that the method cannot be entertained.

Therefore, since it has not been found possible to either cure a diseased plant or eliminate the means of transmission of the virus, it is necessary to concentrate on a programme of *eradication* whereby all sources of the infectious agent are completely eliminated by destruction of all diseased plants. With this object in view proclamations have been made which prohibit (1) The transfer of any suckers whatsoever from infected districts into those areas still free from the disease. (2) The removal of suckers from any plantation within an affected area unless the plantation in question has been inspected and found free from the disease.

If this proclamation is adhered to conscientiously by all banana-growers—the very existence of the banana industry in Queensland depends on this—then the following objects will be obtained:—(1) Clean isolated areas will tend to remain clean; (2) spread within affected areas will be greatly reduced.

Growers must not think that these regulations alone are going to eliminate Bunchy Top. It should hardly be necessary to stress the point that, owing to the rapidity with which Bunchy Top may spread, all growers within an affected area must consider their position as serious. If they do not wish their plantations to follow the fate of those in the Tweed area the following recommendations must be adhered to:—

(1) Set aside a definite time in every week in which to carry out inspection of the plantation for signs of Bunchy Top invasion. Each plant should be separately examined and special attention should be paid to the youngest leaf on each plant in order that the earliest signs of infection may be detected. The area of the plantation should be reduced if necessary to a size which will enable careful examination of this nature to be carried out. Special care should be taken during the warmer months when the aphids are most numerous and active.

(2) If any plant should be found to be infected, the whole stool must be dealt with as follows:—First spray the stool thoroughly with Black Leaf 40 to kill all aphids present. Particular attention should

be paid to the crevices round leaf bases, &c. Black Leaf 40 should be used at the rate of a dessertspoonful to a gallon of water, to which soft soap has previously been added until a good lather is obtained. After spraying, dig out the whole stool and cut the plant up into small pieces which will quickly dry out. It must always be borne in mind that it is not sufficient to treat only the individual plant affected, as the virus may have already passed to other members of the stool, although its presence there is not yet apparent.

(3) All growers should co-operate in seeing that all diseased plants are eradicated from their district, as it is only by achieving this object that the industry can be expected to again reach a stable basis in the affected areas.

LEAF SPOT.

Although some of the oldest growers consider that Banana Leaf Spot has been present in Queensland for the last half-dozen years, it is only recently that the disease has occurred in epidemics of a sufficiently serious nature to cause the grave concern shown in some districts. Leaf Spot is now widely spread and occurs from northern New South Wales in the south to Cairns in the north, including practically the whole of the area in which banana-growing is practised.

Symptoms.

The first indication that a leaf has become infected is the appearance of indistinct linear markings of a light brownish-green colour. These areas are $\frac{1}{8}$ to $\frac{3}{8}$ inch in length and lie parallel to the direction of the veins, two to four of which may be included in their width. These initial spots increase somewhat in width and length and dry out slightly, becoming dark muddy brown to black, linear, linear oblong, or elliptic areas of $\frac{1}{4}$ to $\frac{1}{2}$ an inch in length and about one-third or less of this in width. (Plate 119.) On the lower leaves of young plants the spots are larger and broader and show as dark-brown oval to almost circular areas up to $\frac{1}{2}$ an inch in diameter. (Plate 119 B.) The spots early become surrounded by a diffuse light-green halo, which soon turns a dark yellow and extends its area into the surrounding leaf surface, more especially towards the margin. The central portion of the dark spot representing the region first to be invaded usually dries out to form a lighter grey area, which is often speckled with the black fruiting bodies of the fungus causing the disease. These grey linear or elliptical areas, bordered with black and surrounded with a yellow halo, are characteristic of the disease. Usually the grey spots can be easily distinguished even after the leaf has completely withered. (Plate 119 C.)

The part of the leaf exhibiting yellow discoloration gradually turns brown and dries out. When the spots are sufficiently numerous several lesions may coalesce so that there is formed large peninsulas of dead and dying tissue extending from the margin in towards the midrib and including further spots as these extend. Finally the whole leaf will shrivel.

In a bad attack the spotting will pass from the lower leaves in succession up the plant until all the leaves are left dead and hanging drooped round the rotting pseudostem. The quality of the fruit is reduced by the loss of leaves. When defoliation is severe the bunch will vary in its development according to the stage of maturity at which the loss of leaves occurred. If this should take place before the



PLATE 117.— A BANANA PLANT EXHIBITING TYPICAL SYMPTOMS OF BUNCHY TOP.

fruit have filled out, the bunch will frequently fail to mature sufficiently to be fit for market. This is specially the case with bunches which normally would be cut during the winter and early spring months.

Cause.

Banana Leaf Spot is caused by a fungus belonging to the genus *Cercospora*. The spores of this fungus are narrow elongate, many septate structures formed on the ends of dusky brown upright fungal stalks or hyphæ which project in clusters from the surface of the brown or grey areas mentioned above.

Spore formation may commence soon after the lesion has assumed the dark brown stage, but the presence of the spore clusters is not easily detected until the central spore-bearing region dries out, when they give rise to a speckled appearance over the lighter area so formed. Spores may be found on both sides of the leaf, but as a rule by far the greatest number are produced on the upper surface. From the diseased areas they are scattered by wind and rain to healthy leaves, where, if weather conditions are suitable, they germinate and produce further spotting. On an individual plant the leaves become infected in the order of their maturity from the oldest upwards, and in many cases there is definite indication of infection from a spotted leaf below.

Varietal Susceptibility.

The Sugar and Lady's Finger varieties appear to be somewhat less affected by this disease than the Cavendish, possibly in part owing to their more open habit of growth.

Seasonal Nature of the Disease.

Leaf Spot is of purely seasonal occurrence. The first noticeable appearance is usually about the beginning of March, and from then on the disease becomes increasingly prevalent until the end of winter. With the advent of spring-growing conditions, the disease quickly disappears, the new leaves coming away free from infection. It is usually possible to find some lesions throughout the year, but during the early summer months these are not abundant except associated with old trash. Preliminary experiments with the *Cercospora* responsible for Leaf Spot have indicated that both vegetative growth and spore development are retarded by temperatures above 80 deg. Fahr. The fact that during the summer months in Queensland the temperature commonly ranges above this point may explain to a certain extent the absence of Leaf Spot during this period. However, the marked slackening in growth of the banana plant as well as other conditions mentioned below are considered to largely contribute to the severity of outbreaks during the cooler months.

Contributing Conditions.

It has not been possible so far to accumulate data regarding the direct relationship between weather conditions and the severity of Leaf Spot occurrence. Mr. S. E. Stephens, Inspector, Diseases in Plants, has recorded for the Innisfail district a marked increase in the disease following cold snaps. An abnormally wet rainy season in January and February appears to allow an earlier development of the disease. Possibly the root rot, which in many cases accompanies these conditions, contributes

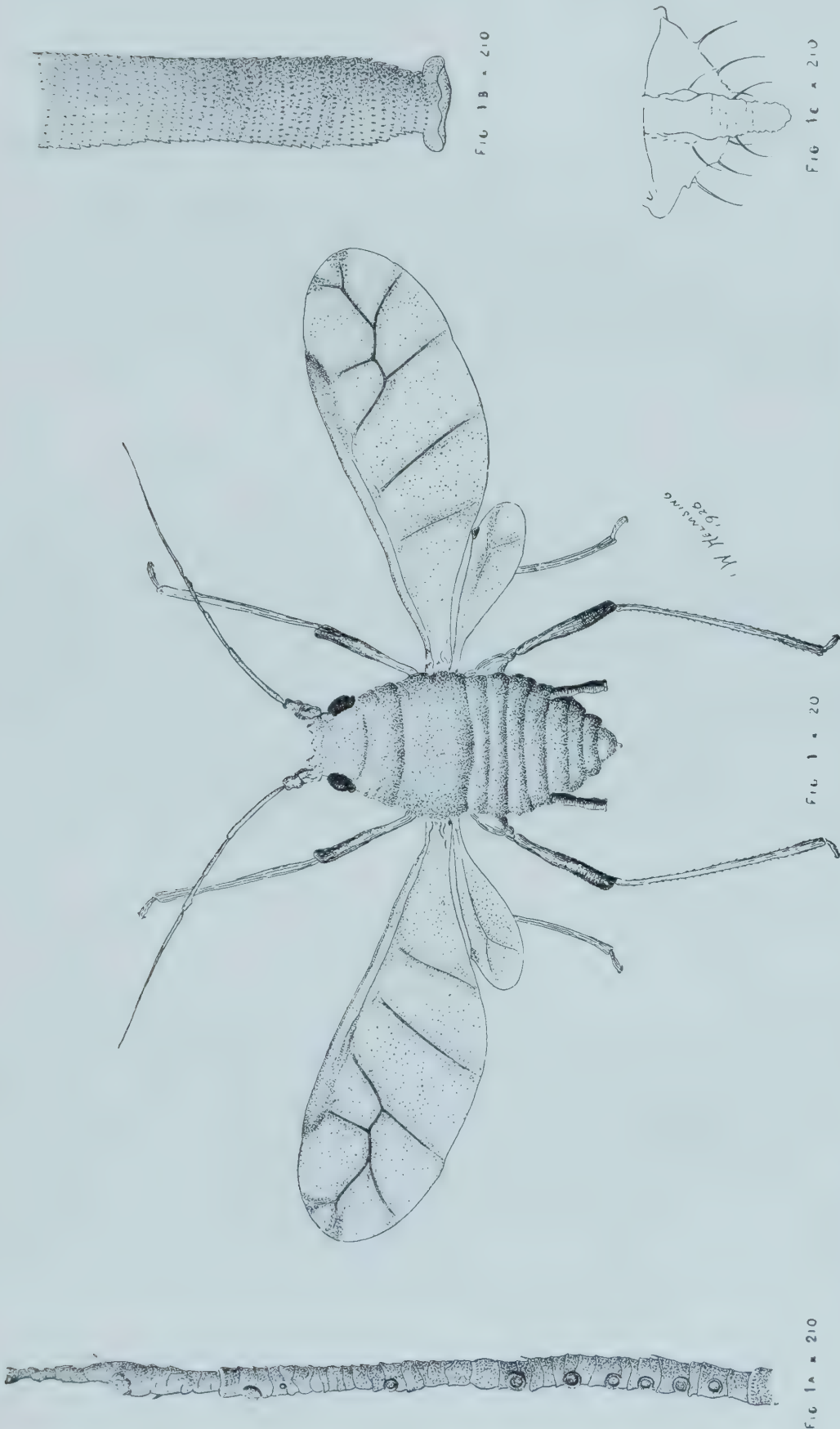


PLATE 118.—THE BANANA APHIS (*Pentalonia nigronervosa* Coo.), THE CARRIER OF THE BUNCHY TOP VIRUS.
Fig. 1. Winged adult x 20. Fig. 1A. Segments 3 and 4 and portion of 5 of antenna of adult, showing sensory organs x 210.
Fig. 1B. Cornicle of adult x 210. Fig. 1C. Anal segment of adult x 210.

to the severity of the attack by weakening the plant. Large plants growing under ideal conditions of soil and location may not be affected to the serious extent displayed by those in poorer badly-drained plantations.

Severe individual attacks of Leaf Spot are frequently associated with the presence of beetle borer, and it is possible that the increase in severity of the disease as a plantation ages is in some measure due to the increase of the insect pest.

Apparently a state of lowered vitality brought about by cool weather or other causes is conducive to severe attack. During periods of rapid growth new leaf development keeps pace with the spread of the disease. Infection of all the foliage seldom takes place before the plant has bunched and leaf production ceased. Even then the abundant spotting leading to complete defoliation seldom occurs until the fruit is approaching maturity and no doubt making use of all available food energy.

Control.

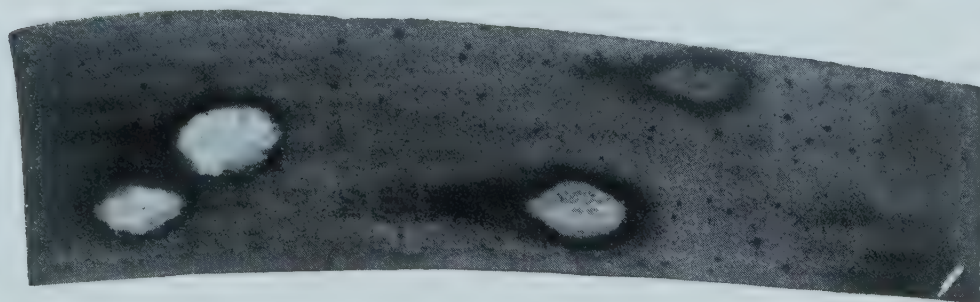
Although Leaf Spot has probably been in Queensland for the last half-dozen years, if not longer, the disease has only recently assumed epidemic form of sufficiently serious nature to attract attention. It is, therefore, not possible at the present time to recommend any certain means of control. Spraying or dusting with a fungicide, which might be advocated for this type of disease, becomes unsatisfactory from the practical standpoint when dealing with a plant such as the banana. However, an experiment to test the efficacy of dusting was carried out during the past epidemic through the much appreciated co-operation of one grower, but the results in this case were not such as would justify the advocacy of this method of control. The value of systematic stripping as a means of reducing the severity of an attack is also being tested out on several plantations. The results from this experiment will not be available until next year.

The following suggestions for the control of Leaf Spot are provisionally submitted:—

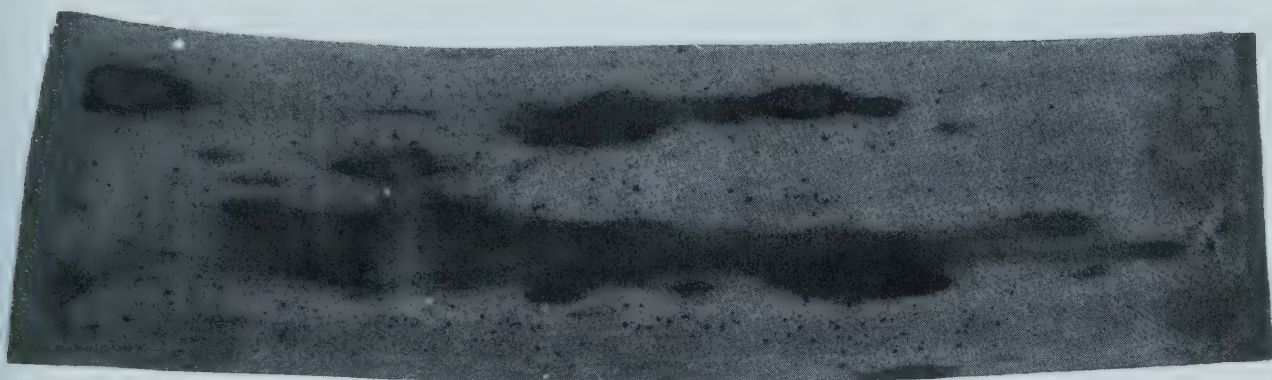
(1) Care should be exercised when selecting a site for a plantation to see that the aspect, soil, and other conditions are those best suited to the vigorous growth of the bananas throughout the year. Good cultivation, and, if possible, manuring should also be practised with the same object in view.

(2) Suckers should be planted as far apart as is economically possible in order to reduce the damp conditions arising in a plantation and lessen the rapid spread of the disease from plant to plant.

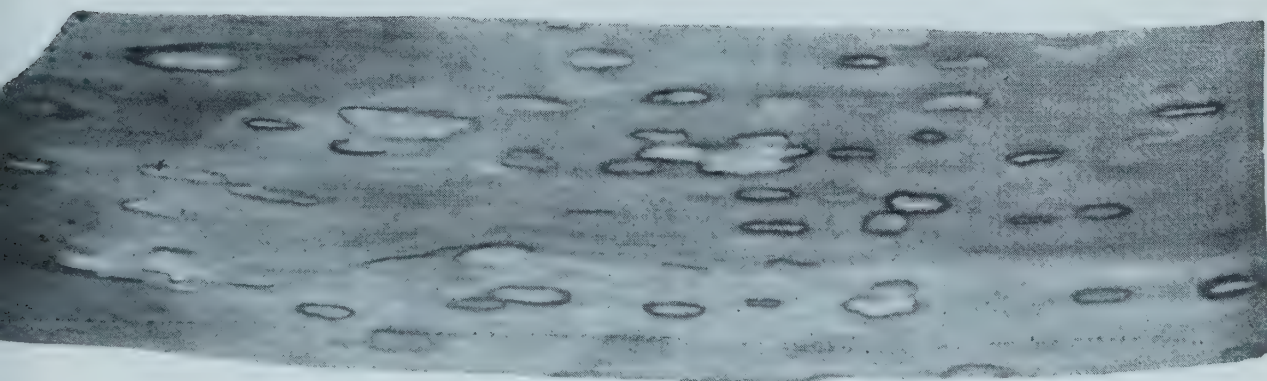
(3) The disease appears always to start on the lower leaves. The spores produced on these in enormous numbers are blown or splashed on to healthy ones above, and there germinate and produce further centres of infection. By carefully removing, by means of a series of frequent inspections throughout the year, all leaves or portions of leaf showing the spots, it should be possible to so reduce the amount of infectious spore material present in the plantation as to make it possible to tide the plants over their susceptible period without extensive damage being effected. The leaves on removal should be burnt or buried below risk of disturbance. The leaves should be removed when the spots are in the light-brown stage, as spore formation may commence soon after they have darkened and the dispersal of these may nullify the results desired. Special attention would have to be paid to these sanitary



A.



B.



C.

PLATE 119.—BANANA LEAF SPOT.

A, Spots as they appear on the first formed leaves. B, Leaf tissue commencing to die as a result of Leaf Spot attack. C, Spots showing up conspicuously on dry leaf killed by the disease.

measures during the first half of the year when the fungus is on the increase, and the grower might well allocate certain days, at not longer than fortnightly intervals, on which the inspection and destruction would take place. Needless to say, plantations which are heavily infested with Leaf Spot will not show immediate benefit from this treatment. The fact that the amount of Leaf Spot appearing in a new plantation is slight and increases only as the stools age and more spore-bearing material accumulates, would indicate that this method of control is well worth a thorough trial.

Leaf Spot usually first appears in a new plantation as more or less isolated spots on the lower leaf or two of the young plants. Probably these are derived in many cases from spores introduced with the suckers on to which they had fallen in the old plantation. Careful attention given to the removal of these first affected leaves, as soon as the spots appear, may be of special help in reducing the rate of subsequent spread of the disease.

PANAMA.

This disease affects only the tall-growing varieties of banana, including the Lady's Finger, Sugar, and Gros Michel. The Cavendish or dwarf banana appears to be completely resistant under Queensland conditions, and since this is the common commercial variety grown in Queensland, Panama disease has not so far become the serious menace in this State that it has in other banana-growing countries where the Gros Michel is the standard. Very considerable loss has been sustained, however, by those cultivating susceptible varieties, more especially since few of these growers realise that they are dealing with a specific disease, so that methods of exclusion and eradication are seldom practised.

Symptoms.

The first signs of an attack of Panama appear on the lower leaves of the plant. The leaf blade commences to turn a deep yellow colour round the margin and along the edges of any shredded segments. As the yellowing advances inwards the portion first affected turns brown and dries out. After this has progressed to a certain extent, the leaf-stalk collapses near its junction with the sheathing base, and the dying leaf hangs down round the pseudo-stem. The leaves are progressively affected in this manner from the base up, and finally the pseudo-stem may appear devoid of all green leaves with the dry shredded remains of these hanging round it. Frequently the outer sheathing bases of the leaves will split upwards longitudinally.

If the plant is infected in the early stages of its growth a bunch may not be thrown or, if one is produced, this will be stunted and the fruit will not mature properly. Plants less seriously affected will often throw a marketable bunch, but one inferior to that which would have been produced by the plant in a healthy state. This latter state may occur in the case of the Lady's Finger variety, which appears to be somewhat more resistant to the attack of Panama.

The best diagnostic characters of Panama disease are internal. If the butt of an affected plant be dug up and split lengthwise, the base of the corm will be found to be discoloured by numerous reddish-brown to black lines running in all directions through the white tissue, and sometimes so numerous as to cause almost complete blackening of the central region of the corm. These lines represent the vascular strands composed of large water-conducting cells which are here rendered

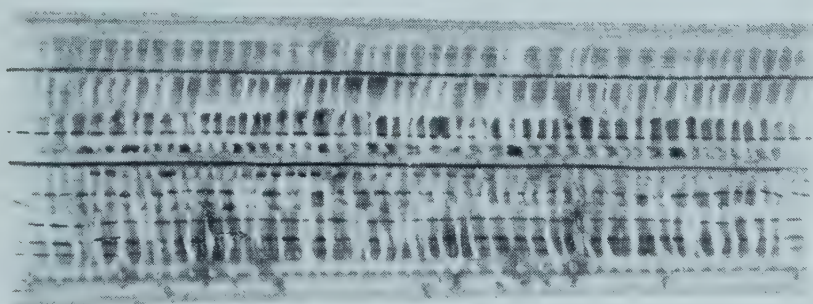
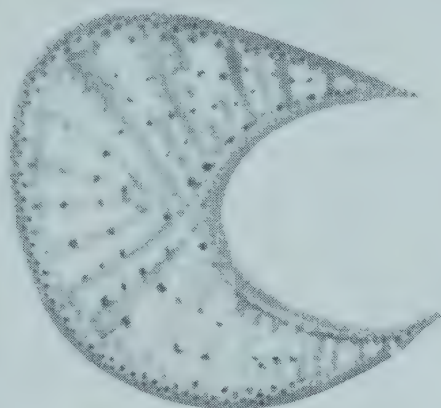
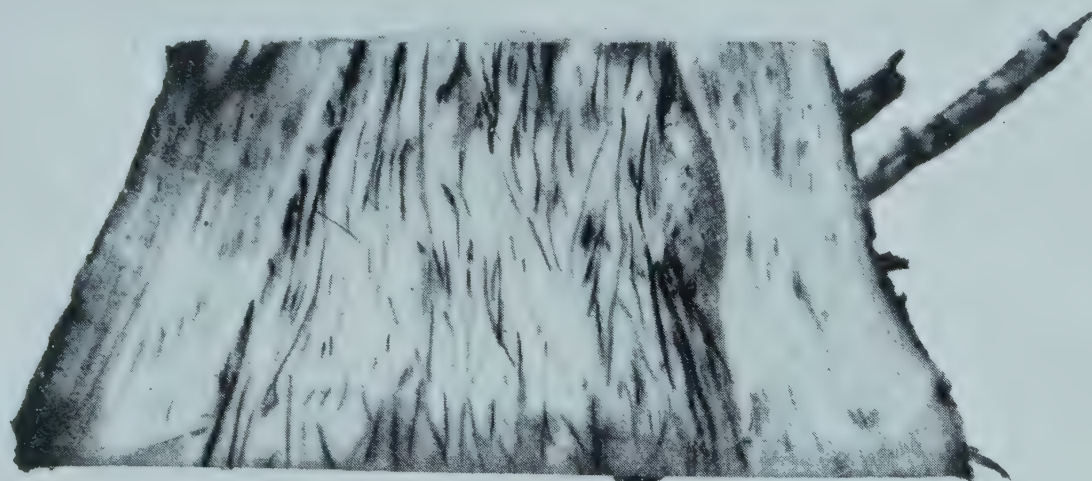


PLATE 120.—PANAMA DISEASE.

Above.—Longitudinal Section of affected corm, exhibiting characteristic blackening of the vascular strands.

Below.—Transverse and longitudinal sections of a leaf stalk, showing the continuance of the discoloured strands into this region.

fungus or its toxic secretions within them. The brown vessels can be followed up through the corm into the sheathing leaf bases, and from there will often be found extending almost to the ends of the midrib of the leaf. (Plate 120.) A quick diagnosis for Panama can often be made by slitting up the base of the stalk of a withered leaf, near its junction with the pseudo-stem, when these affected vessels may be observed as one or more light yellowish-brown, brown, or reddish-brown lines running up the vertical partitions of the stalk.

Cause.

Panama disease in Queensland would appear to be caused by the same fungus (*Fusarium cubense*), as is responsible for the disease in Central America. The fruiting bodies of this fungus are produced on both upper and lower surfaces of the leaf and leaf-stalk. They take the form of minute clusters of branched fungus threads which project through the epidermis and bear numerous small sickle-shaped spores. The spores are washed away by the rain and blown by the wind, and if in the process they reach a suitable situation, they may germinate and infect a healthy plant.

The spores are capable of developing and growing for a certain time in the soil. Infection may take place through young tender roots or through wounds in the corm. Once within the plant the fungus grows up through the vessels, producing the symptoms noted above. Infection of young plants frequently takes place by the fungus present in an old parent corm growing out through the tissue connecting it to the surrounding suckers, and in these setting up the same diseased conditions as obtained in the parent. The planting of such infected suckers is one of the chief means of distributing the disease.

Control.

The only satisfactory way of dealing with Panama disease is by a combination of exclusion and eradication.

(1) Only land which has not previously grown bananas, or land on which Panama disease has never been known to exist, should be planted with susceptible varieties. This precaution is necessary since the fungus may remain for a number of years in the soil even after affected plants have been removed.

(2) Special care should be taken that suckers are obtained only from a district in which Panama disease is definitely known not to exist. Suckers obtained from within an infested area are always liable to be infected, and signs of this might escape detection by the grower.

(3) In spite of these precautions a plantation may become infected by means of wind-borne spores or by infectious material accidentally introduced on boots, &c. A careful watch should therefore be kept for the appearance of the disease, and if a plant is observed showing symptoms of Panama, the whole stool should immediately be dug out and the affected plant, together with any invaded suckers, should then be removed carefully so as to avoid spreading spores about, chopped into pieces and burnt. Any instrument used in cutting a diseased plant must be disinfected by washing in a fungicidal solution, or by passing through a flame, before it is again used on a healthy banana. It is important for this eradication process that diseased plants are detected and removed in the early stages of the disease before spore formation has commenced. It is very unwise to replant in the spot from which a stool has had to be removed.

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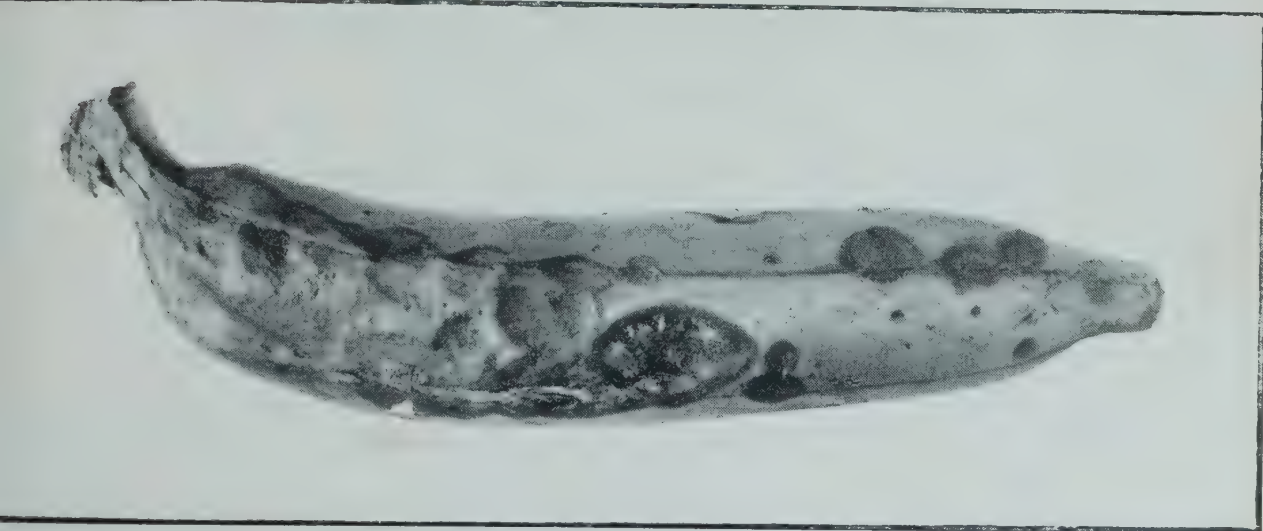
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PLATE 121.—CIGAR END.



PLATE 122 —STEM END ROT.



DRY ROT.

Dry Rot is not a disease of serious consequence owing to the fact that it is only an isolated plant or a small group of plants that is usually affected. However, in the absence of knowledge regarding the disease, its appearance sometimes causes concern.

Symptoms.

An individual plant or stool may exhibit a cessation of vigorous growth and later the leaves commence to die back from the margins. Finally the whole plant dies back and turns brown and dry.

It will be found that the plant so affected may be easily pushed over as it is practically devoid of sound roots. On cutting open the corm a portion or the whole of the interior is seen to have been changed to a substance of a more or less dry, "punky" nature of a dirty white to brown colour. This consists of a mass of closely interwoven fungal threads which have invaded the corm and largely replaced the plant tissue.

Cause.

Dry Rot may be caused by several fungi, including a *Poria*, belonging to the Basidiomycetes or higher fungi. These fungi live for the most part on dead and rotting stumps such as are usually present in abundance in the average banana plantation. From here certain of them are able to pass to a living banana plant, should such be growing in close proximity, and, by invasion of the corm, produce the Dry Rot described above. Growers have noticed that the stumps of certain species of trees are more commonly associated with these dry-rot-producing fungi.

Control.

Often Dry Rot does not spread beyond the original stool attacked, but on some occasions the fungus gradually extends its area of attack to adjacent stools. For this reason it is advisable when a plant is observed to be affected to locate, if possible, the stump or root from which infection has proceeded and remove and burn this together with the affected corm.

FRUIT ROTS.

A. Stem End Rot.

This disease is sometimes known as Black End owing to the fact that affected fruit exhibit a black area of soft rot round the stem end.

Symptoms.

The trouble usually commences as a dark water-soaked area formed in connection with a bruise or other injury to the short fruit stalk or working in from its broken end. (Plate 122.) As the rot progresses the stalk turns completely black and becomes much shrunken and sometimes shredded. From the stalk the soft blackened area extends through the skin of the fruit at a more or less rapid rate, the pulp beneath turning soft and watery.

Stem End Rot is not a disease of the plantation as it usually appears only when the fruit are approaching maturity, especially after long distance consignment.

Cause.

Associated with this rot are usually to be found fungi of the genera *Verticillium*, *Glocosporium*, and *Fusarium*. It would appear that under suitable conditions any weak wound parasite of this type would be capable of producing similar injury. Careful examination of affected fruit will reveal the fact that the primary cause of the trouble lies in injuries given to the fruit during the frequent handling to which it is subject. The injury may be due to bending the fruit stalks while the hand is still on the bunch. The bruise resulting from this is sufficient to constitute a point of entry for the rot-producing fungi without a definite abrasion of the skin. The wounds and bruises arising from tearing apart the fingers from the hand will also serve as infection points. These latter are a common source of trouble in cased fruit.

Control.

(1) As regards fruit marketed in the bunch it is essential that the bunches receive most careful handling from the time they are cut until they reach the consumer. When one considers the rough treatment the fruit is often subjected to it is remarkable that not more damage results.

(2) In order to lessen Stem End Rot in cased fruit it will be necessary to pack in hands or half-hands rather than in singles. The hands should be carefully cut off round the collar by which they are attached to the central stalk, and if it is necessary to reduce them in size the division should be made by a sharp knife and not by a tearing process.

(3) The grower should avoid accumulating a heap of rotting banana refuse round his packing shed. This material serves as a breeding ground for the various organisms causing Stem End Rot and spores produced here may serve to contaminate fruit during the process of packing. The discarded fruit and stalks could be thrown into a pit and covered every now and then with a layer of soil.

(4) The same need for cleanliness may be stressed with regard to some ripening rooms. The absence of a regular cleansing programme will increase the chance of infection with rot fungi.

B. ANTHRACNOSE.

Anthracnose is of rare occurrence in the plantation, where it occasionally appears in the form of a leaf and fruit spot. More commonly it is met with as a ripe rot of the fruit on the market.

Symptoms.

The early stages appear on the skin of a ripening fruit as small muddy brown rather diffuse spots. These enlarge rapidly and take the form of slightly depressed areas, rounded or irregular in shape, and dark brown to almost black in colour. The spots may coalesce until large areas of surface present a black, rotting appearance. When subjected to moist conditions, the older parts of the affected areas become covered with minute pink pustules formed by the spore masses of the causal fungus. (Plate 123.) In the early stages the affected area is restricted to the skin, but soon the pulp below the spot becomes invaded and takes on the water-soaked appearance of a soft rot, which rapidly spreads through the tissue rendering the fruit unfit for consumption.

Anthracnose occasionally appears on the leaves as large elliptical brown areas which may extend to include considerable areas of leaf surface.

Cause.

Anthrachnose is caused by a fungus (*Glæosporium musarum*). This organism is only of a weakly parasitic nature and is not usually found attacking fruit except in the later stages of ripening. It may considerably hasten what is commonly termed the over-ripe condition. Bruising of the fruits will contribute to the attack of this fungus.

Control.

The control measures for Anthrachnose should follow the same general lines as advocated for Stem End Rot. Attention must be paid to careful handling to avoid bruising and to the practice of cleanliness at the packing shed, market and ripening room.

C. CIGAR END.

In contrast to the two previously mentioned fruit troubles, cigar end is a disease to which the fruit become subject in their more immature stages. Commonly only a few of the fingers on a bunch exhibit the symptoms, but records have been received in which the whole bunch has been affected.

Symptoms.

Affected fruit exhibit a firm black rot at the apex. The extent of the decay varies from a scarcely noticeable ring of black tissue round the terminal crown to a regular extension back for half an inch or more. The affected portion shrinks, in many cases becoming more or less rounded in contrast to the angular shape of the immature fruit. (Plate 121.) The blackened tissue then becomes covered from the distal end back with an ashy grey or sometimes pinkish grey coat of fungal spores, which give, in typical cases, the striking resemblance to a burnt cigar tip to which the disease owes its name. The old shrivalled floral organs often persist for considerably longer than the normal period on affected fruit.

Cause.

A fungus (*Verticillium sp.*) is almost universally associated with cigar end, and it is the conidiospores and spores of this organism closely studded over the affected region which gives rise to the grey covering characteristic of the disease. A consideration of the early stages of attack would suggest that infection may possibly take place through the tender floral structures which appear particularly susceptible to fungus invasion.

Control.

Definite recommendations based on a full investigation cannot be made at present. It is suggested that the young bunch be opened up to the light and air and the bracts which sometimes tend to remain attached to the developing hand, especially during wet weather, be removed as soon as possible.

D. SQUIRTER.

Squinter is a trouble of a somewhat obscure nature which shows up mainly in connection with fruit which has undergone long distance consignment to Southern States. After ripening, the centre of the fruit will be found to have turned to a soft, watery mass, which will squirt out when pressed. The symptoms would suggest that Squinter may be connected with physiological disturbances arising out of the present ripening and transport methods. The true nature and cause of Squinter is at present under investigation.

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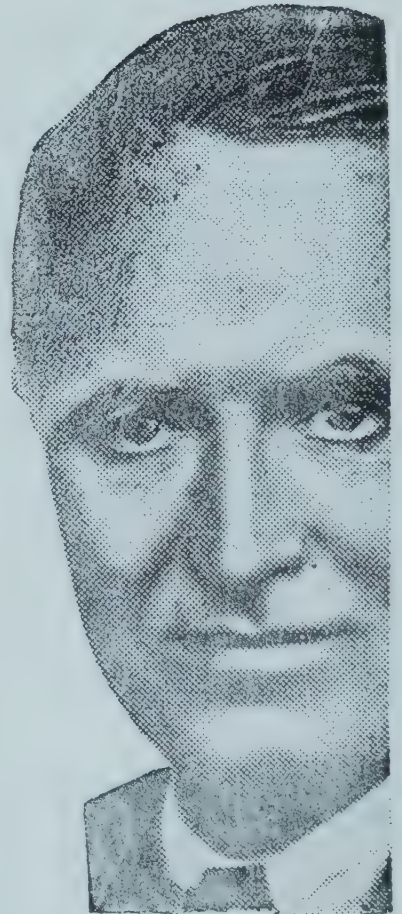
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LEAF SPOT OF BANANA IN SOUTHERN QUEENSLAND.

Dr. B. T. DICKSON, Chief, Division of Economic Botany, Council for Scientific and Industrial Research.

AS soon as any plant is grown intensively and extensively as a crop, it becomes liable to suffer from diseases which more or less affect the vitality of the plant and reduce the yield, and to this generalisation the banana is no exception. Some diseases require the interaction of an insect carrier which transmits a highly infectious "virus" from plant to plant, and even the best tended plantations may be devastated by such a disease as the now well-known "bunchy top." In other cases general conditions of hygiene in the plantation, combined with unfavourable climatic environment for the time being, bring into prominence a disease which may in other seasons not be a serious factor. It is to this latter group that the disease at present under consideration apparently belongs.

As a result of the perturbation among banana growers in Southern Queensland occasioned by the prevalence of Leaf Spot, the Hon. W. Forgan Smith, Secretary for Agriculture and Stock in the Ministry of the Government of Queensland, requested the Commonwealth Council for Scientific and Industrial Research to enable the writer to undertake a survey of the situation. In the course of this investigation the following places were visited:—

22nd, 23rd, 24th June: Gympie, Scrubby Creek, Goomboorian, Cedar Pocket.
25th, 26th June: Cooran, Kinkin, Pinbarren, Traveston.
27th June: Eumundi, Belli, Manni road.
28th June: Landsborough, Bald Knob, Mount Mellum.
1st July: Montville.
2nd July: Ormeau.
3rd July: Southport.

Findings.

In every plantation except at Southport (where the bananas were surrounded by salt water) Leaf Spot was prevalent. In most cases it was causing serious loss, and it will have definitely reduced the yield of bananas by the end of the winter season. It was quite common to find plantations where but few of the bunches now formed will fill out and mature because of the complete dying of the foliage. Furthermore, the disease is manifesting itself in young non-bearing plantations, and this naturally causes serious worry among the growers as to the fate of future crops.

During the tour the weather was unpleasantly wet and cold, but it served to show that many of the plantations are on ill-drained and unsuitable soil even though on a steepish slope. Such plants were found to have an extremely poor root system, almost all the roots being brown and rotten. Again, borer was too prevalent, and but little attempt was made in many cases to check its spread. Some growers who had taken precautions to check borer, as recommended by the Department of Agriculture, were satisfied that, although it was not a complete check, it was worth while. Unfortunately, part of the industry is "nomadic," in that after three years a plantation is forsaken and another started. The old plantations must undoubtedly become a great breeding-ground for borer and fungi, from which newer neighbouring plantations may automatically become affected.

Another striking feature was the fact that cold weakened the foliage in some plantations and here Leaf Spot was making rapid headway.

The point in noting the above-mentioned facts is that I feel this season's condition to be the culmination of a series of troubles. The organism causing Leaf Spot is possibly seasonal and not likely to be a very strong parasite. Given poor root systems, borer at work, soil not suitable, cold and wet weather, and there is a combination to suit the fungus which has gradually been gaining momentum in the plantations. Debilitated plants succumb under such a combined attack as one would expect. It is interesting to note that the youngest leaves are not usually seriously affected, even when older leaves are hanging dead, until the bunch begins to mature, and they then become spotted from the tip back until they in turn die.

Characteristics of the Disease.

As the name indicates the chief symptom of the disease is the spotting of the leaves. The lower leaves are affected first, the number of spots appearing depending on the conditions for infection in the plantation. If there is an abundance of

diseased foliage and rains are frequent there is also an abundance of infection, and it appears as if the disease gradually gets up a momentum so that there is a serious increase in its severity.

The middles of the rather oval spots die and become somewhat ashy brown in colour, and later a fungus develops its spore-bearing bodies in that dead tissue. From these small black fungal bodies many thousands of spores are spread during continued wet or muggy weather.

Gradually the spot invasion reaches the upper leaves, those below being now dead and hanging down against the stem. It was a common sight to see a plant with but three living leaves left at the growing point, and when the bunch is attempting to mature fruit it needs all the foliage possible since it draws upon the leaves for its starch. In some cases the bunch was developing sufficiently fast and was already near enough shipping maturity that it would just scrape through, but much more frequently it was just reaching that stage of maturity when the demand on the few remaining leaves was heaviest. At this time they also became infected with Leaf Spot and rapidly succumbed so that the bunch could not mature.

A disease such as this occurring in banana plantations on hillside slopes is not easy to control by spraying or dusting for obvious reasons, and until a thorough study is made none but general recommendations can be suggested. It does appear, however, that the general cleanliness of the plantation, the state of culture, and consequent health of the plants is important. It is worth while therefore for growers to consider cleaning up abandoned plantations, keeping down diseased trash in present plantations, and obtaining clean suckers for future plantings. The provision of a windbreak between plantations might also protect a clean area.

Suggested Investigations.

It must be clear to a thinking grower that some time to study the disease and its attendant conditions must elapse before any definite remedial measures can be proposed.

In view of the above facts and others not given in so general an account, the following points are noted as some of the phases requiring investigation:—

1. Study of the organism causing Leaf Spot to determine its identity, temperature and humidity relations, method and conditions for infecting the leaf, conditions of spore development, longevity of the organism in dead leaves and of the spores when free (wind blown, &c.)

2. Effect of leaf age on infection. Effect of root injury, due to water-logging, or excessive drying; or fungal attack and infection by borer, and the susceptibility of the plant to infection. Effect of cold and of malnutrition from poor soil and the susceptibility of the plant to infection.

3. Amount of spot in summer as compared with winter. First occurrence in autumn and winter. Relation of occurrence to dew or rainfall or generally cloudy conditions.

4. Control measures, such as dusting with copper-lime dust, trimming affected leaves as soon as possible in season (trashing), liming soil, draining water-logged areas, cultural practice modification (chipping, cover crops, &c.), baiting for borer.

5. Relation of "freckle" to leaf death and its possible inter-relation with Leaf Spot.

6. Comparison with possibly similar diseases occurring elsewhere than in Australia.

Recommendations.

As noted above it is obvious that some time must elapse before the full story of the Leaf Spot disease can be set down. A start has already been made by Mr. Simmonds, of the Department of Agriculture. Full time work on diseases of banana and pineapple is quite justified by the economic importance of the industry in Queensland.

The suggestion is made, therefore, that Mr. Simmonds be freed from other duties to concentrate on banana and pineapple diseases. I feel that, given the opportunity and the facilities, he already is sufficiently aware of the problem to make good headway. In so far as my other duties permit it will give me pleasure

to afford such help to Mr. Simmonds as he may from time to time require. I trust also that the growers will back up any investigation with wholehearted co-operation. There is definite evidence of interest on the part of many of them which is most encouraging.

Acknowledgments.

It affords me great pleasure to express my appreciation of the facilities afforded me and of the many personal kindnesses shown during the survey. To Hon. W. Forgan Smith and Mr. Graham for departmental hospitality and help, and to Mr. Veitch and Mr. Simmonds for personal company and field knowledge freely placed at my disposal, to Mr. Ranger and Mr. Ellison for detailing the trip so that the Committee of Direction officers were available in each district, to those officers for their excellent arrangements in spite of inclement weather, and to the growers who were good enough to attend in considerable numbers in spite of work and weather, my thanks are due.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING SEPTEMBER, 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Sept.	No. of Years' Records.	Sept., 1928.	Sept., 1927.		Sept.	No. of Years' Records.	Sept., 1928.	Sept., 1927.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
	In.		In.	In.		In.		In.	In.
Atherton ...	0·70	27	0	0·28	Nambour ...	2·70	32	0·42	6·97
Cairns ...	1·75	46	0·10	1·45	Nanango ...	1·90	46	0·09	0·54
Cardwell ...	1·60	56	0	1·37	Rockhampton ...	1·40	41	0	1·39
Cooktown ...	0·60	52	15	0·43	Woodford ...	2·29	41	0·60	5·20
Herberton ...	0·51	41	0	0·17					
Ingham ...	1·59	33	0	2·52	<i>Darling Downs.</i>				
Innisfail ...	3·72	47	0·02	1·70	Dalby ...	1·75	58	0·15	0·37
Mossman ...	1·64	15	0·11	1·14	Emu Vale ...	1·84	32	0	0·29
Townsville ...	0·87	57	0	1·07	Jimbour ...	1·58	40	0·02	0·68
					Miles ...	1·44	43	0·03	0·25
<i>Central Coast.</i>					Stanthorpe ...	2·37	55	0·36	0·51
Ayr ...	1·55	41	0	0·95	Toowoomba ...	2·22	56	0·26	1·49
Bowen ...	0·87	57	0	0·97	Warwick ...	1·86	63	0·02	0·61
Charters Towers ...	0·80	46	0	1·02					
Mackay ...	1·67	57	0	1·42	<i>Maranoa.</i>				
Proserpine ...	2·35	25	0	2·42	Roma ...	1·52	54	0	0·56
St. Lawrence ...	1·31	57	0	1·12					
<i>South Coast.</i>					<i>State Farms, &c.</i>				
Biggenden ...	1·64	29	0·29	1·47	Bungeworgorai ...	1·17	14	0	0·03
Bundaberg ...	1·71	45	0·15	1·00	Gatton College ...	1·65	29	0·14	1·27
Brisbane ...	2·03	77	0·78	1·77	Gindie ...	1·11	29	0	0
Caboolture ...	1·95	41	0·20	3·15	Hermitage ...	1·61	22	0	0·68
Childers ...	1·90	33	0·57	1·89	Kairi ...	0·72	14	0	0·29
Crohamhurst ...	2·79	35	0·25	6·14	Sugar Experiment Station, Mackay	1·63	31	0	2·17
Esk ...	2·24	41	0·82	1·60	Warren ...	0·89	14	0	1·25
Gayndah ...	1·60	57	0·19	3·13					
Gympie ...	2·17	58	0·24	2·41					
Kilkivan ...	1·76	49	1·21	0·98					
Maryborough ...	1·99	56	0·41	2·09					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for September this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

Cotton-Growing in Queensland.

The results obtained in the last six seasons have demonstrated that the Cotton Plant can be successfully cultivated over a large area in Queensland. During this period a variation in seasonal conditions, ranging from drought to flood, has been experienced. In each of the seasons referred to, however, splendid yields have been obtained by farmers in the majority of the main cotton-growing areas. It was only to be expected that at the revival of operations in cotton-growing in this State a number of unprofitable yields should be individually recorded, owing to the inexperience of the growers and the lack of knowledge of the correct methods to be adopted. Decided progress has, however, been made in each successive season, until there are at present many successful cotton-growers in the State.

This article is issued at the direction of the Minister for Agriculture and Stock (the Hon. W. Forgan Smith) in order that the primary producers of the State may be made acquainted with some of the factors which have a direct bearing on the yield obtainable from a crop of cotton. In addition to this feature, several phases of the major problems which confront cotton-growers are discussed, and the activities of the Department of Agriculture and Stock in its aim to assist in the solution of these problems are described.

INCREASE IN THE AVERAGE YIELD PER ACRE.

Problems for the Grower.

There are so many factors entering into the problems of increasing the average yield per acre that it is exceedingly difficult to lay down any "hard and fast" rules for growers to follow. Each has to experiment and determine the value of any particular method when applied to the soil and climatic conditions. The suggestions embodied in this Bulletin have been arrived at as a result of observations made in commercial crops, and in experiments with farmer co-operators, over a wide range of soil and climatic conditions during the past six seasons.

Soils.

In the early stages of the present revival of cotton-growing in this State, there was much confusion of thought as to the most suitable soils for the purpose. Realising this point and taking into consideration the inexperience of the growers, the guaranteed advances of the Queensland Government were made sufficiently high to allow of a test of cotton-growing in all classes of soils, and an excellent demonstration of the suitability of the various soils was thus afforded. At the

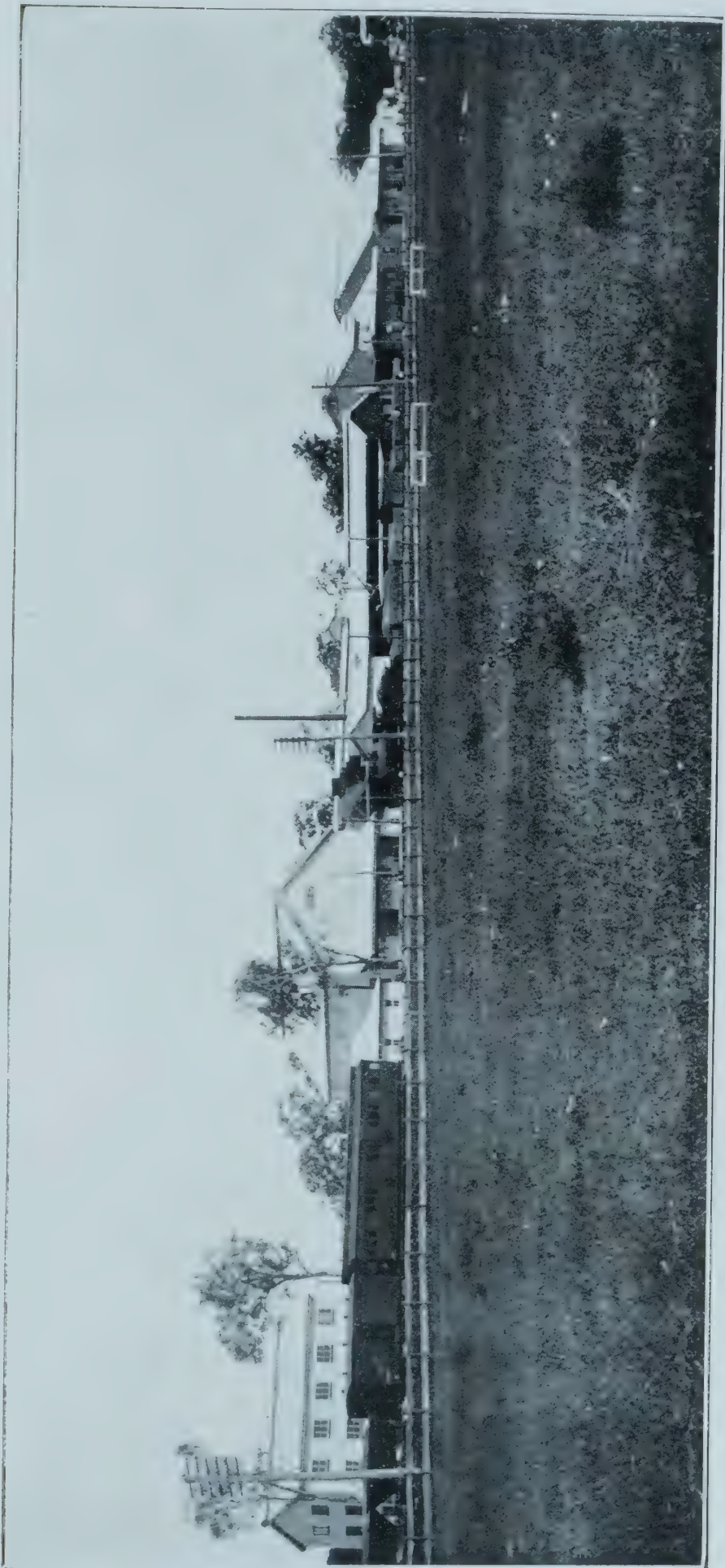


PLATE 124.—COTTON GINNERY AND OIL MILLS, WHINSTANES, NEAR BRISBANE

termination of the system of guaranteed prices, a fairly clear general definition had been obtained of the most suitable districts, and, to some degree, the most suitable and unsuitable soils for cotton-growing.

Broadly speaking, the most suitable soils are those of a loamy nature overlying a clayey subsoil to a depth of 1 to 3 feet. There appears to be a wide range of soils of this type, varying from the sandy and heavy alluvial loams to the heavy loams of the mixed brigalow and soft vine scrubs. Cotton crops grown on such a combination, whilst they seem to have a high degree of productivity under drought conditions, are also able to produce a normally developed plant in a wet season. The explanation appears to be that the clayey subsoils hold the moisture up to the lower lateral root system. In a dry season, the moisture is thus available, whereas in a wet one the tendency to thorough saturation produces what has been described as a "physiological drought effect." Under the latter condition there is so much moisture around the root system that there is a restriction of the amount of available plant-food.

The quality of the soil is an important factor in successful cotton-growing.

It is essential in every type of soil that there shall be a proper balance of readily available plant-food. On some very fertile soils of great depth, where this balance is present rank development may occur at the expense of fruiting, when excessive rainfall is experienced. Generally in the case of any peculiar growth, other than that caused by loss of crop through some external agency such as insect attack, &c., the soils can be suspected to be lacking in some of the plant-foods required by the cotton plant or containing insufficient humus. It is suggested that each grower should check the yields of the various portions of his crop and thus determine which portions are non-profitable producers. An analysis of these sections may show either that the fault can be easily corrected or that the remedy which might be suggested to make it a productive area could not be favourably considered from an economic standpoint.

Preparation of the Seed-bed.

The general experience of most of the cotton areas has been that the early preparation of the seed-bed assists in obtaining a good yield. Several factors appear to be involved in this phase of cotton-growing, the chief of which is the effect on plant growth and insect life. Owing to the light rainfall of the usual autumn and winter seasons in the cotton belt it is often difficult to prepare a proper seed-bed. Consequently, if the preparation is delayed until the early spring months, such a short time elapses before the usual planting rains set in that the seed-bed is of an open nature and is generally lacking in moisture in the lower levels. From results obtained on the Callide Cotton Research Station, growers have had it demonstrated to them that, by the preparation of the seed-bed as soon as possible after the old crop has been harvested, a strike may be obtained on the first planting rains which will be maintained over a dry period of some length.

The old crop should be cut off and burned and the land ploughed by the end of July if possible. Not only does this provide a period of from seven to twelve weeks before planting-time for the seed-bed to firm,

but much destruction of any pupæ of injurious pests is accomplished. It is strongly recommended that the bushes be cut off and burned instead of ploughed out or under, as is done in some cases. A modification of the old slide maize-cutter can be constructed to cut the plants at small expense, and a thorough clean-up is easily effected by dragging the cut bushes together by means of harrows.* This allows of the destruction of large numbers of Stainer insects as well as any pests which may be in the unopened bolls.† The burning of the old plants also allows of the preparation of a firmer seed-bed than is the case where the plants are turned under.

Planting Seasons.

In every one of the last six seasons the general experience has been that early planting gave profitable results. The explanation appears to be that the seasonal conditions during October and November are conducive to the development of a well-fruited plant, where the sowing has been made in the latter half of September or the first half of October. The night temperatures are then generally low, and ordinarily, only light storms are experienced. The seedlings make a slow growing stocky plant with a good root system under such conditions, and after the summer rains commence in December a splendid fruiting system is developed. Such a structure usually produces a sufficient crop of squares and bolls to control the plant's growth during the wet season in late January and February, unless the soils are exceptionally fertile and very heavy rainfall is recorded. Even in cases where these conditions occur, the early planting of crops tends to prevent excessive growth.

Sow your cotton seed in late September or early October.

It appears at present that early planting offers the best and most economical means of escaping serious attacks of the Corn Ear Worm (*Heliothis obsoleta*). In each season excellent yields of cotton have been obtained at the Callide Cotton Research Station from early planted plots, while late planted cotton in close proximity to the early plots has been so seriously attacked that no crop was harvested. It is believed that the controlled growth of the early-sown crops which causes a slow toughened development of the plants, together with the fact that a large amount of squares are being developed when the heaviest broods occur, are responsible for the good yields even when the Corn Ear Worms are known to be present in large numbers. A considerable loss of squares on early-sown plants may result from attacks by this grub, but the heavy rate of setting of squares still permits of the production of a profitable crop of bolls. The reverse conditions generally exist in the late-sown crops where the plants are making a soft sappy growth under the extremely forcing conditions of the hot "wet season" months, and any removal of the light crop of developing squares accelerates the rate of growth without an accompanying increase in the rate of setting of squares. The result is often a tangled mass of rank vegetation with only a light crop of bolls which, in districts where frosts occur, are seldom harvested.

* A description of this machine was published in the June, 1928, number of the "Queensland Agricultural Journal."

† Detailed descriptions of the various insect pests which attack cotton in Queensland are given in the Bulletin "Cotton Cultivation in Queensland," published by the Department of Agriculture and Stock in 1928.

Planting Methods.

The average cotton-grower does not sow a high enough rate of seed. The rate of sowing advocated by the Department, and which is the one adopted by the Cotton Board in the distribution of the planting seed, is 20 lb. to the acre. It is known, however, that large numbers of the growers only plant at rates varying from 10 to 15 lb. to the acre. This is a mistake, as the seed costs only a penny a lb., and though a small initial saving is made by planting at a lighter rate, a much lower financial return is generally secured owing to the occurrence of gaps in the stands obtained. The argument is often advanced that the lighter sowing facilitates thinning and thereby reduces the cost of that operation. The slight saving which may be effected, provided the thinning is carried out at the proper time, is more than off-set by the loss of stand in the lighter sowings. One has but to endeavour to space an experiment requiring an 18 or 24 in. spacing in a crop sown at the rate of 15 lb. to appreciate the large number of gaps in a field where such a spacing cannot be accurately obtained. It is believed, therefore, that 20 lb. should be the lightest rate used, and where there is danger of the soils crusting if rains fall after planting, an even higher rate may be used to advantage.

Thinning.

The thinning of the crop is often looked upon as a very expensive operation and, in some cases, as unnecessary. The results obtained over most of the cotton areas by growers, and also in experiments, indicate that thinning is a necessary operation. It need not be as expensive as many growers make it, however, if the work is done at the proper time and with the correct implement. The writer has seen many growers using amongst small plants heavy unsharpened chipping eye-hoes with crooked "sapling" handles, with an expenditure of energy that would have removed good-sized weeds. If the proper cultivation has been maintained, the thinning can be performed with a light goose-neck garden hoe. This implement is operated with considerably more accuracy and less effort than is the heavy chipping hoe, with the result that an energetic person can thin up to 3 acres a day.

Cultivation.

Cultivation is one of the most important operations in growing a crop of cotton, and yet it is astonishing that so little study is given to this subject by many of the growers. Four cultivations, at least, should be given to the average cotton crop, and therefore every effort should be made to have each operation efficient. Particular attention should be given to the kind of points required at each cultivation and especially to the set of inner points next to the plants, as it is by the proper use of the cultivator that much hand labour can be eliminated.

There are several types of suitable cotton cultivators now obtainable in Queensland, all of which embody the principle of driver-steered machines rather than the rigid tongue machine which is steered by guiding the horses. Much finer work close to the plants can be performed by the former machines, as in this type the steering is done by the driver operating either the wheels or by a movable foot-steered suspended carriage. These machines can be fitted with various points such as diamond-pointed teeth, 8, 10, and 12 in. sweeps or duck feet, half steels, hillers, and on some machines the carriage for attaching points can be exchanged for one with discs. With such an assortment



PLATE 125.

Plant long, straight rows and thus improve the efficiency of the cultivating machinery through the class of work performed and by the additional acreage covered per day. Short rows increase the number of turnings per acre with a consequent loss of time. Experiments have failed to demonstrate that there is any advantage obtained by planting the rows according to the compass, therefore plant the long way of the field if the slope of the land allows.



PLATE 126.

Start thinning when the plants are from 4 to 6 inches high and complete the field by the time the plants are from 6 to 8 inches high. The plants in the illustration average 6 inches in height.



PLATE 127.

Illustrating efficient cultivation. The plants in the foreground are velvet bean seedlings, which are very brittle, yet with the equipment being used no damage was done to them. The soil is of a clayey nature and the cultivating is being done three days after a hard rain.



PLATE 128.

Illustrating a well-cultivated field. Note the good stand of plants right up to the end of the rows.

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of equipment for the cultivator, a grower can obtain the right combination for each particular operation and thus ensure a maximum of efficiency.

All the factors which have been touched upon contribute to the increase in the yield of seed-cotton per acre, and in several respects to the improvement of the quality of the cotton produced. They are, therefore, of extreme importance, as the increase of the yield per acre offers the most promising means for the reduction of the cost of production, which in conjunction with the improvement in the quality will result in an increased net return to the grower.

COST OF PRODUCTION.

The reduction of the cost of production is the big problem of the Queensland cotton-grower and, while it may be difficult in some instances, it is believed that most of the growers can make substantial improvement in this respect. In the majority of the cotton-growing areas of this State the land values are relatively low to those existing in the districts where other farm crops are grown which would give returns comparable to those obtained from cotton, and the interest on investment in land is thus proportionately less. The amount of machinery required to grow cotton in an economical way, however, totals in the neighbourhood of at least £150, exclusive of the necessary horses. The yearly interest and depreciation on this capital investment therefore amounts to an appreciable amount. Where a farmer is growing only cotton, the whole sum has to be charged against this crop and it is necessary that there should be sufficient acreage under crop to keep the expenditure per acre on a reasonable basis. As one man can cultivate 40 acres of cotton with equipment costing the abovementioned sum, it will be seen that any crop acreage of less than this amount would increase the overhead expense per acre.

Up-to-date methods of cultivation reduce the cost of production and increase the acreage yield.

In most of the main cotton-growing areas where large blocks of suitable land may be obtained, one man, with the help of extra labour at thinning time, can take care of 40 acres if he farms properly. In farming properly, he will need to pay attention to the various factors which have been pointed out as bearing on the yield per acre. As several of these factors may affect the quality of the cotton produced, it would appear that there should be a high degree of correlation between the most efficient use of machinery and the production of yield and quality thereof. As these factors all affect the cost of production and the net return obtained per acre, it is believed that every grower should study the size of his acreage and endeavour to ascertain if he is getting the fullest benefits from cotton-growing that he is able to obtain from his farm.

When the possibilities which cotton-growing offers in this State become more fully appreciated, it is considered that the resultant increased area per individual and acreage under cotton will permit of a substantial decrease in the ginning and marketing charges, and may also assist in obtaining a greater return from the seed. It is to be

hoped, therefore, that the difficulties which have been experienced in the spinning industry in this country will be remedied so that the Queensland cotton-growers will have reason to place every confidence in the future of the industry. When this confidence is established it is anticipated that the various factors which have been discussed in this article will become of extreme interest to cotton-growers, and that the value of the suggestions which have been made will be amply demonstrated.

QUEENSLAND GOVERNMENT ASSISTANCE TO COTTON-GROWERS.

The State Government realised when instituting the system of guaranteed advances to encourage farmers to grow cotton, that a careful study of the problems connected with cotton-growing was necessary if the industry was to be permanently established. A Cotton Section has, therefore, been developed in the Department of Agriculture and Stock to deal with the growing of this crop, and the proper grading of the article harvested from it. The personnel consists of a Cotton Specialist, in charge, assisted by a Field Staff under a Cotton Experimentalist, and a Grading Staff under a Cotton Classifier. A Cotton Research Station has also been established in the centre of the Callide Valley, which is one of the largest cotton-growing districts of the State. To meet the annual recurring expenses of conducting the Station, financial assistance has been granted by the Empire Cotton Growing Corporation for a five-year period which terminates at the end of the season of 1928-29.

The activities of the Cotton Section of the Department can be briefly grouped under the following headings:—

- (1) Research investigations into the various problems connected with the growth and development of acclimatised strains of cotton.
- (2) Ascertaining and demonstrating the application of the results obtained at the Research Station to the various climatic and soil conditions existent in the different cotton-growing areas.
- (3) Introduction of the possible suitable varieties of cotton, and the development of acclimatised strains with tests in the different districts.
- (4) Assistance in the conduct of entomological investigations relating to insect pests attacking the cotton plant, with demonstration of the application of prescribed remedial measures.
- (5) The establishment of standards of seed cotton for grading the cotton as it arrives at the Ginnery.
- (6) The classification of the ginned product for marketing purposes.

The Department of Agriculture and Stock invites the co-operation of cotton-growers in an effort to firmly establish the industry.

For administrative purposes, the cotton belt, which roughly extends from the Boonah district in the South to the Rockhampton

district in the North, and includes the inland valleys between the Coastal and the Main Dividing Range, has been divided into three districts with headquarters at Ipswich, Maryborough, and Rockhampton. A Senior Field Officer of the Cotton Section is stationed at each of the centres mentioned to conduct the various activities of the section in the respective areas. During the off-grading season, the cotton-graders attached to the Cotton Section are detailed to assist in the conduct of experiments with the grower co-operators.

Each season a total of 100 to 150 experiments are arranged with growers, dealing with varietal and fertiliser tests, investigations in the spacing of the rows and of the plants in the rows, the effect of different heights of thinning, soil studies, &c. Finality is not reached in many of these experiments owing to varying causes, but each season provides an accumulation of evidence on the various problems which eventually may allow definite answers to be obtained in connection with many of them. The conduct of these experiments and the close study necessary to obtain satisfactory results from them have provided an excellent means for training the Field Staff in the problems incidental to the growing of cotton in this State, and it is believed that the Department has a staff of investigators in cotton-growing which will be able to give increasingly valuable assistance to the growers coincident with the development of the industry.

Establishment of Research Station.

Much of the experimental work of the Field Staff, as has been stated, is based on the study of the application of results obtained at the Cotton Research Station. It was appreciated at the beginning of the organisation of the Cotton Section, that many problems existed which would require such careful study that an Experiment Station would be necessary. Accordingly, a Station of 400 acres in area has been developed, of which about 130 acres is under cultivation. A staff is maintained at the Station to conduct the technical investigations relating to problems connected with the growing of cotton. As a result, the effect of different cultural treatments on such factors as the rate of square setting and flowering, the rate and time of opening of the bolls and the fibres contained in them, and allied subjects, can all be carefully studied to much better advantage than in co-operative plots.

The activities of the staff also embrace the studying of such factors as the effect of the rotation of crops, the determination of which are the best crops and varieties thereof to use in rotation, the effect of green manuring and of soils and climatic conditions on the various parts of the plant, and similar subjects. Such data often assists in explaining any peculiar results obtained in experiments, and the experiences of cotton investigators in other countries indicate that the tabulation of such information is essential.

Activities of Field and Grading Staff.

In addition to these features of the activities of the Cotton Section, a comprehensive system of seed acclimatisation has been developed. Marked improvement has already been effected in the commercially grown variety, and there is little doubt that in each successive season the seed supplied to growers will show improvement in quality.

It has been the policy of the Department of Agriculture and Stock to ensure that, if possible, only one variety of cotton should be grown in

Queensland. The experiences of other countries all indicate the many advantages that are to be obtained where it is possible to concentrate on only one variety. It is especially desirable that such should be the case in this State on account of the comparatively small amount of cotton produced, and also of the fact that the crop is sent to only two or three centralised ginneries. A multiplication of varieties would increase the difficulties connected with the storage of cotton of the different grades and staples, and would also endanger the maintenance of the purity of the plant seed. Accordingly, the endeavour to obtain strains of the one variety acclimatised to the different districts is one of the most important features of the breeding work of the staff.

The Cotton Section also co-operates with the Board controlling the Cotton Pool in the heating of the planting seed for the destruction of insect pests. The Department of Agriculture secured two Simon's heaters, which have been loaned to the Cotton Board, and an officer of the Cotton Section is always present to keep a check on the temperatures during the heating operations. As a check on these operations, a range of samples of the treated seed are submitted to the Seed Investigation Branch of the Department for testing as to germination powers. It can be seen, therefore, that a comprehensive scheme for the development, maintenance, and supply of suitable planting seed has been evolved.

It was realised that in conjunction with the development of a Field Staff to deal with the cultural and breeding problems it would also be necessary to develop a system whereby the cotton crop would be properly graded, if the grower is to obtain the full benefit of his labours. The services of a Cotton Classer, with experience in the United States in handling cotton of similar characteristics to those of the Queensland crop, was therefore obtained from Liverpool. A staff of trained wool classers was recruited for training in cotton-grading under the Cotton Classer. Sets of the World's Universal Standards for American Upland Lint Cotton were also obtained and standards for seed cotton which when ginned would give lint values equivalent to the various lint grades of the World Universal Standards were established.

Cotton-growers would assist the graders if they made an endeavour to blend the contents of each pack.

Uniformity in Grading.

A marked improvement in the uniformity of the grade within the one bale of lint was obtained under this scheme of operations, and as the graders have been employed for the last five crops a well-trained grading staff is now available. It may be pointed out, however, that the cotton-grower must assist the grader if the proper degree of uniformity is to be maintained. It is not expected that the grower should grade his cotton and pack the different grades into separate wool packs for despatch to the ginnery, but it is considered that each grower should endeavour to blend the contents of each wool pack. Many wool packs as they are fed up the suction spout to the gins show layers of cotton of different grades. The containers had been filled by emptying the picker's sacks straight into the pack, thus forming layers of different grades according to the cleanliness of each picker. Efforts are made to

obtain a uniform grade of such cotton by blending the contents of two or three wool packs as the cotton is fed to the spout, but the same uniformity cannot be obtained as in cases where the grower thoroughly mixes the contents of each wool pack before filling it. This is a very important point and every grower should endeavour to eliminate this variation in grade within the one container. With the enlargement of the areas under crop the tendency to empty the picker's sack straight into the wool pack is increasing, and as a result a larger number of bales containing different grades are being produced at the ginneries. These bales of mixed grade represent an economic loss to the Cotton Board, and while the individual grower may not be penalised in his initial advance, he causes a diminution in the amounts of the final advances which are distributed to all the cotton-growers.



PLATE 129.—A QUEENSLAND COTTON FIELD.

Cotton-growing is playing an important part in bringing into cultivation large areas of country which have formerly been devoted only to cattle-raising. The photograph shows portions of a station which ran about a beast to 10 acres. This cotton crop would average a gross return of from £10 to £15 per acre.

As has been stated, during the off-grading season, graders are attached to the Field Staff to assist in the operations connected with the conduct of experiments. This not only ensures the efficient employment of the graders during the whole year, but affords an excellent opportunity for them to study the effects of the different soil and climatic conditions. This training enables them to understand the nature of the various types of cotton which are received at the ginneries, and assists them in the allocation of the consignments to the different grades and staples.

Samples are drawn from both sides of each bale of lint as it is ginned and are forwarded to the Cotton Classifier for his inspection and determination of grade and length of fibres, or "staple," as the Cotton trade terms it. This permits of a constant check of the work of the graders at the ginneries and any discrepancies are quickly remedied.

Cotton-growers of Queensland can therefore be assured that their crop will be graded carefully and accurately and any mistakes which may occasionally be made are rectified where possible. Any errors which may be made are generally due to the presence of mixed grades in the one wool pack. The growers must co-operate with the graders by sending only the one grade of cotton within the one container. Where more than one grade is included, it is necessary for the grader to estimate the average value of the contents, which is not only unsatisfactory but slows up the grading operations to an appreciable extent.

It can be seen therefore that the cotton-grower of this State has the effective support of the Government in the solution of problems incidental to success in this activity. Undoubtedly there are many problems to be solved before the full possibilities of cotton-growing are realised. Decided progress can be made, however, if more attention is paid to the points which have been discussed in this bulletin. It is confidently believed that with the passage of time information of decided value to the cotton-grower will be obtained from the comprehensive scheme of operations on which the staff of the Cotton Section is now engaged. Such information, combined with the knowledge of cotton-growing which the farmers have gained by experience, should assist to place cotton-growing amongst the profitable primary industries of this State.

SUMMARY.

Cotton-growing combines excellently with dairying.

Briefly, the situation regarding cotton-growing in this State may be summarised as follows:—

1. Excellent yields of cotton can be produced over a large area of country.
2. The favoured cotton country lies between the coastal and the Main Dividing Ranges and the valuation of much of this country is low in comparison with that of the more closely settled coastal areas. A considerable area of Crown land is also available in the districts suitable for cotton-growing.
3. Owing to the distance of these areas to markets for perishable produce, dairying appears to be the most suitable of the older established industries.
4. Cotton-growing combines excellently with the dairying industry—the cultivation period of the former occurring at such a time as to permit both industries to be practised in conjunction. An attractive feature is that the returns from cotton-growing are received during the period when dairy production is at its minimum.
5. The implements necessary for cotton production can also be used in the production of maize or fodder crops. By a combination of cotton-growing with these industries the overhead expenses are distributed.
6. The general average yield of cotton per acre is much lower than individual average yields of many experienced farmers.
7. The average yield per acre can be appreciably improved if more attention is paid to the selection of suitable types of soil for cotton-growing.

8. The general experience of cotton-growers is that early preparation of the seed-bed and planting as soon as possible after the soils have warmed up sufficiently to promote steady growth gives the best results.

9. Early planting appears to be conducive to the setting of a heavy crop before the "wet season" starts. A reduction of the possibility of loss from attack by the Corn Ear Worm (*Heliothis obsoleta*) seems to be associated with well-fruited early-sown plants.

10. The average grower uses a light rate of seeding under the belief that economies in the thinning operations will be obtained. It is believed that the loss of stand as a result of the adoption of this method more than counterbalances any initial financial gain secured through the limitation of the supplies of seed purchased.

11. The thinning and cultivating operations may be performed more efficiently and economically if the proper implements are used at the correct time.

12. The cost of production in Queensland must be reduced, and the increase of the yield per acre offers the easiest means to accomplish this result. It is considered that if more attention were paid to the different features which have been touched upon in this article, the average yield per acre would show a decided increase.

13. A Cotton Section has been developed in the Department of Agriculture and Stock, to assist the growers in the solution of problems connected with growing cotton in this State. Trained Field and Grading Staffs are actively engaged in the investigation of production and the proper preparation of the crop for marketing.

14. A Cotton Research Station has been established where detailed technical investigations can be made in such problems as the effect on the cotton plant of rotation with different crops, green manuring, cultural operations, and soils. Studies are also conducted in evolving and building up supplies of suitable strains of acclimatised seed.

15. A comprehensive system for the supply of plant seed of suitable acclimatised varieties has been developed for the whole of the cotton belt.

THE VALUE OF MILK.

On account of the amount of water in milk (writes J. A. Ruddick, of the Canadian Department of Agriculture), it is often thought expensive by many who do not know its real food value. This is chiefly because it is in liquid form, and because it is often used as a beverage. Milk, however, has not as high a percentage of water as strawberries, turnips, tomatoes, oysters, and many other foods in solid form. About four-fifths of the human body is made up of water. Although milk contains such a high percentage of water, it is still an indispensable food, because its solids have all the food essentials, which entitles milk and milk products to the main place in the diet of the young and of the old.

THE JOURNAL A GREAT HELP.

A Mulgeldie farmer writes (9th September, 1928)—"I have seen your Journal with one of my neighbours. It will be a great help for me and my family as newcomers to this country."



PLATE 130. THE LATE MR. ANGUS MCTAVISH THORBURN.

OBITUARY.**THE LATE ANGUS THORBURN.**

It is with profound regret that we have to record the death, on 2nd October, of Mr. Angus McTavish Thorburn, a Field Officer of the Fruit Branch of the Department of Agriculture and Stock. Although he was only twenty-seven years of age at the time of his death, he had crowded into his life more experiences than usually occur to the average public servant. Joining the Department as a boy he immediately set himself to qualify for admission to the clerical branch of the service, and in less than two years he was able, as a result of night studies, to pass the Public Service Examination. In 1917, when only seventeen years of age, he joined the A.I.F. and proceeded with the 42nd Battalion to France, where a serious wound received on the Somme interfered with his promotion to at least non-commissioned rank. Returning to Brisbane he was attached to the Cane Prices Board, and in the capacity of reporter for that body and compiler of costs of production returns he travelled regularly, until 1923, throughout the whole of the canegrowing districts of the State. He then became associated with the Fruit Branch, and in his usual thorough manner at once started to qualify for the technical side of this section. He passed his examination as an Inspector under the Diseases in Plants Act in 1924, and after five months' service at Rockhampton was detailed for the field staff of Southern Queensland. Here he was regarded as one of the keenest and most efficient members of the Branch. For the past two years he was directly connected with the campaign for the eradication of Bunchy Top.

The late Mr. Thorburn possessed a fine character and was an excellent type of young Australian, mentally alert and physically vigorous. By his devotion to duty he won the high respect of his fellow officers and of those engaged in the industry which he served so assiduously and ably. Added to other excellent qualities was an attractive personality which won for him many friends.

A keen yachtsman, he was the first secretary of the Queensland Yacht Racing Association and a popular member of the Royal Queensland Yacht Club. He was also a member of the Sandgate Yacht Club, under the burgee of which he sailed his own boat, the well-known rater, "Venetia." A skilful skipper and a sportsman in the best sense of the term, he was highly esteemed in aquatic circles. He was also a member of the Sandgate Golf Club.

On 3rd October he was laid to rest in the Lutwyche Cemetery. In addition to his sorrowing relatives and more immediate friends the large gathering at the graveside included many representatives of primary producers' associations and the commercial and official life of the city. Among them were Mr. E. Graham (Under Secretary); Mr. Robt. Wilson (Assistant Under Secretary); Professor E. J. Goddard (Dean of the Faculty of Agriculture, Queensland University); Messrs. E. G. Scriven (former Under Secretary); Richard Short (Chief Clerk); Geo. Williams (Director of Fruit Culture); A. Person, H. Collard, J. Stockdale, R. Prest, H. Barnes, Wilkie Lewis, C. Williams, W. D. Wilson, H. Crofts, A. Green (officers of the Fruit Branch); J. F. Reid (Editor of Publications); J. P. Orr (Registrar of Co-operative Associations); John Munro and A. Young (Records Branch); C. McKeon and H. Hunter (Agricultural Branch); M. L. Cameron (Dairy Branch); V. Bohan and W. J. Copley (Accounts Branch); T. A. Powell, E. J. Hoey (Central Cane Prices Board); B. Rice, J. Canniffe (Royal Queensland Yacht Club and Q.Y.R.A.); C. Sheehy and V. Short (Council of Agriculture); G. S. Pratten, S. G. Nevill, R. Miller, G. H. Nash, and J. G. Armstrong (Railway Department).

The casket was covered by the Union Jack, and many of his old comrades of the Australian Imperial Force, including a number of his fellow officers in the Department, attended to pay a last tribute of respect.

The sympathy of the whole community which the late Mr. Thorburn served so well is extended to his young widow and stricken relatives.

ABSTRACTS AND REVIEWS.

“The Timbers and Forest Products of Queensland.”

By E. H. F. SWAIN. Handbook of the Queensland State Forest Service—450 pp., 6 plates. Published August, 1928, with foreword by Hon. Thos. Dunstan, M.L.A., Minister for Lands. Price, postage paid—Paper bound, 6s. 6d.; Cloth, 9s. 6d.

“Queensland is a Treasure House of Fine Woods.”—Hon. Thos. Dunstan, M.L.A.

Two hundred odd timbers of Queensland are written up in this book. Each tree is fully described, and the principal points of its identification in the field are set forth with a list of the vernaculars in use in various districts. Its geographical distribution is given, with adequate notes upon temperature, rainfall, and soil environment, for the use of silviculturist and acclimatisator. The timber itself is dealt with in extenso; its colour, weight, texture, and appearance described; its characteristic qualities in use discussed; and its applications in industry carefully inventoried. Both its advantages and disadvantages for various purposes are finally summed up.

The two hundred timbers treated are arranged under the Universal Wood Indexing System, so as to permit of ready reference. The System itself is described, and the reader is instructed how to identify wood for himself. An Index itself is appended which enables the wood user and wood lover to critically compare the Queensland timbers with other well-known woods of the world's commerce. Finally, for the guidance of the wood user, prescriptions in Queensland timbers are offered for every possible industrial purpose.

The book is a thesaurus of the most recent information upon the trees and timbers of the State, their availabilities, values, and uses.

But there is a fund of data also in other directions. For the bee-farmer there is a chapter upon the honey flora of Queensland, together with a monthly timetable of the flowering of the native trees and bushes. The charcoal resources of the forests are discussed; the wood pulping pros and cons are set forth, with notes upon the potentialities of the available native material; the tanning materials of the State are scheduled and described; the grass tree gums, nuts, and other forest products are dealt with, and, finally, there are summarised for ready reading the researches which have been made upon the essential oils of the trees and shrubs of Queensland.

The book is a comprehensive compendium of information upon the trees, timbers, and forest products of Queensland. It is a publication for the forest and timber lover, the wood user, the architect, the timber merchant, the sawmiller, the carpenter, the tanner, the bee-farmer, the arboriculturist, the timber-getter, the chemist, the forester, and the acclimatisator.

It should be used in every school in connection with Nature Study, Rural Economy, and Manual Training. It is very readably written, and the average man will find it interesting and informative. It may be obtained through any book-seller or forest officer or from the Secretary, Provisional Forestry Board, Executive Buildings, Brisbane.

GRAPE FRUIT.

By GEORGE WILLIAMS, Director of Fruit Culture.

Several varieties of grape fruit (*Citrus paridisi*) have been introduced into this State, and have been found well adapted to local conditions. Unfortunately there has been some confusion in what really constituted a grape fruit, and the “poor man's orange” of various types has been frequently sold under that name much to the detriment of future sales of the genuine fruit. A Japanese variety catalogued as *Citrus natsumikin* has also tended against the improvement of market prospects. Though resembling the real grape fruit in shape and size, the skin is coarse and the flavour and texture more resembling those of the rough lemon. The difference in general appearance may be noted in the illustration in which Marsh's seedless depicts the typical commercial grape fruit. In California this is practically the only variety grown, and so that standardisation may be reasonably effected it is desirable that a similar course be followed here. Triumph possesses a slightly different flavour which may be more appealing to some palates, but the large number of seeds contained is a disadvantage. Several pink-fleshed varieties have more attractive appearance when cut, but are considered deficient in other important respects. The fruit only requires to be better known to be widely appreciated. It is profusely produced from an early age on trees of hardy constitution and good habit.



PLATE 131.—MARSH'S SEEDLESS GRAPE FRUIT—HABIT OF FRUITING.

*Citrus notsumkin.*

PLATE 132.

Citrus paridisi (Marsh's).

QUEENSLAND TIMBERS FOR FISHING-RODS.

By C. J. J. WATSON, Queensland Forest Service.

THERE is an old proverb which says that "a prophet is not without honour save in his own country." Queensland has many such misjudged "prophets" in timber form. Our native timbers are often thought to be inferior to those imported when used for special purposes, and to many people the name "scrubwood" means "useless."

These impressions are entirely wrong. Because a fishing-rod is made of imported Greenheart or Lancewood, it is not necessarily better than the local product. Provided that the same care is exercised in selecting the best trees, and then cutting and seasoning the timber in the correct manner, Queensland timbers will give better results than the imported ones.

A number of Queensland timbers, mostly scrubwoods, which give excellent results when made into fishing-rods are described below. When it is considered that Maple Silkwood (*Flindersia Brayleyana*) and Red Cedar (*Cedrela australis*) (both kings among cabinet woods) are scrub woods, the term "scrubwood" will not be used in a belittling manner.

Saffron Heart (*Halfordia scleroxyla* and *Halfordia drupifera*).—These two woods, also known in different localities as Ghittoe and Kerosene Wood, are so much alike in general appearance and character, that they are sold together as Saffron Heart.

Trees of Saffron Heart occur in coastal rain forests from the border to the Atherton Tableland, with diameters varying from 1 to 3 ft. in mature trees. The best trees occur in the vicinity of the National Park, and in the Atherton district. Supplies for the Forest Service are obtained from Atherton.

Saffron Heart is a hard, heavy, close-grained, highly-elastic and very strong timber. It is saffron-yellow in colour, from which it has been named.

Carefully selected, straight-grained Saffron Heart is more than twice as strong as the best English Oak. Pieces which are sold for "middles" by the Forest Service only $\frac{5}{8}$ in. square and 3 ft. in length, will carry a weight of over 1 cwt. at the centre, when supported at each end.

Saffron Heart is of a greasy nature, and requires a long time to season properly. If made into a rod when unseasoned, it is much weaker, and will not return to its original shape after being bent. This is common to most timbers. Saffron Heart should not be oiled, as it is already naturally oiled. When finished, all that is necessary is a coat of polish or hard varnish to exclude the air. The wood can be made harder and more "steely" by case-hardening the outside of the piece by twirling it over a flame. This hint has been borrowed from the aborigines of North Queensland, who employed this method to harden their spears. It must be remembered that timber shrinks in drying, so that the "middles" and "tips" should be left a little oversize before placing over the flame. If this is not done, the ferrules will afterwards be found to be too big.

Large supplies of fully-seasoned "middles" and "tips" of this timber may be obtained at a cost of 1s. 6d. each at the Fancywoods Section of the Queensland Forest Service, in William Street. All supplies are guaranteed, and pieces which are broken through faulty grain will be replaced, if returned, free of charge.

Queensland Greenheart (*Endiandra compressa*) is a small tree reaching a diameter of about 1 ft. in the coastal rain forests of Southern Queensland. The wood of this tree is extremely hard, close-grained, heavy, and very strong, being equal to Saffron Heart in this respect. The inner heartwood of the tree is a dark-greenish-grey colour when seasoned, and is preferred for rod tips.

Green Satinheart (*Geijera Muelleri*) is also known to bushmen as Greenheart, Axe-breaker, Gap-axe, and Glasswood. The heartwood is very hard, close-grained and heavy, and when fully seasoned is highly elastic and very strong. A large number of the trees of this species are cross-grained and very tough, and are useless for rod tips. Only selected timber should be used.

Brown Spearwood (*Acacia rhodoxylon*) is another timber which was prized by the aborigines for spears on account of its great strength.

The tree grows slowly in very dry country, and seldom reaches a diameter of more than 10 in. It is common in the Rockhampton district, where it is known as Rosewood Wattle.

The wood is dark chocolate-brown in colour, and is very hard, close-grained, and heavy. When dry it has an enormous strength, excelling even Saffron Heart at times, but retaining its elasticity.

Brigalow Spearwood (*Acacia harpophylla*) is similar in character to Brown Spearwood, and occurs in similar districts having a low rainfall, but it is slightly paler in colour, lighter in weight, and more open-grained.

The remarkable strength and elasticity of Brigalow Spearwood is clearly shown by the following details, kindly supplied by Mr. Cross, who is an expert angler and professional rodmaker. He says:—"A light two-piece rod tapering from 5/16 in. to $\frac{1}{2}$ in. at the tip, and 8 ft. long, landed a jewfish 14½ lb. in weight. A similar rod 8 ft. long with a cork butt and weighing only 6½ oz. was sufficient to lift a bream 1¼ lb. in weight from the water, and bream struggle hard. Three-piece rods 9/16 in. at the first ferrule (at the top of the butt), 7/16 in. at the second ferrule, and tapering to a 3/16 in. tip will safely lift 7 lb. at the tip."

This is supported by a test carried out by the Queensland Railways, which showed that in bending, Brigalow Spearwood has a modulus of rupture to 25,000 lb. per square inch, which is almost a quarter again as strong as the best Ironbark.

Spotted Irongum (*Eucalyptus maculata*) when straight-grained will give fair service in a rod, but it is not nearly so strong as Saffron Heart and the Spearwoods.

Brown Tulip Oak (*Tarrietia argyrodendron*) makes a good rod if carefully seasoned and made up when it has reached correct stage of dryness. When green, this timber is not elastic, and when too dry it becomes brittle. This tree is very common in coastal scrubs.

Brown Salwood (*Acacia aulacocarpa*) makes a very strong, light rod. The timber is brown in colour, open-grained, and very strong. It is not nearly as heavy as Brown Spearwood.

Trees are fairly common in Southern Coastal Queensland, and are usually found along scrub edges or near creeks. The stems are seldom over 9 in. in diameter, of which a good proportion is pale-coloured and not suitable for rods.

Rod butts may be made from any fairly strong timber which is heavy enough to balance the middle and tip. Those timbers which have a handsome figure are preferred by many fishermen.

One of the most handsome of hard timbers for this work is Tulip Plumwood (*Pleiogynium solandri*), which when polished shows a striped-brown figure like Tulip.

Other timbers with a good figure are Rose Walnut (*Cryptocarya erythroxylon*) and Red Satinay (*Syncarpia Hillii*), while plain-figured woods which work easily and finish with a smooth surface are Orange Boxwood (*Celastrus dispermus*), Rose Marara (*Weinmannia lachnocarpa*), and Yellow Boxwood (*Sideroxylon Pohlmanianum*).

Most of these timbers can be purchased from the Forest Service in butt size for 1s. per piece.

QUEENSLAND RAIN-FOREST TREES.

By W. D. FRANCIS, Assistant Government Botanist.

The Grey Handlewood or Native Elm attains a height of about 60 feet and a stem diameter of nearly 2 feet. The tree shown in the accompanying field photograph is a comparatively small one. The species is known in botanical terminology as *Aphananthe philippinensis*. As the name indicates, the species is found in the Philippines. In Australia it is distributed as far south as the Manning River, according to J. H. Maiden, and has been found as far north as Herberton in Queensland. The wood has been used for axe handles. The leaves are very harsh to the touch, and, on account of the fine, rigid asperities on their surfaces, could be used as a substitute for sandpaper.

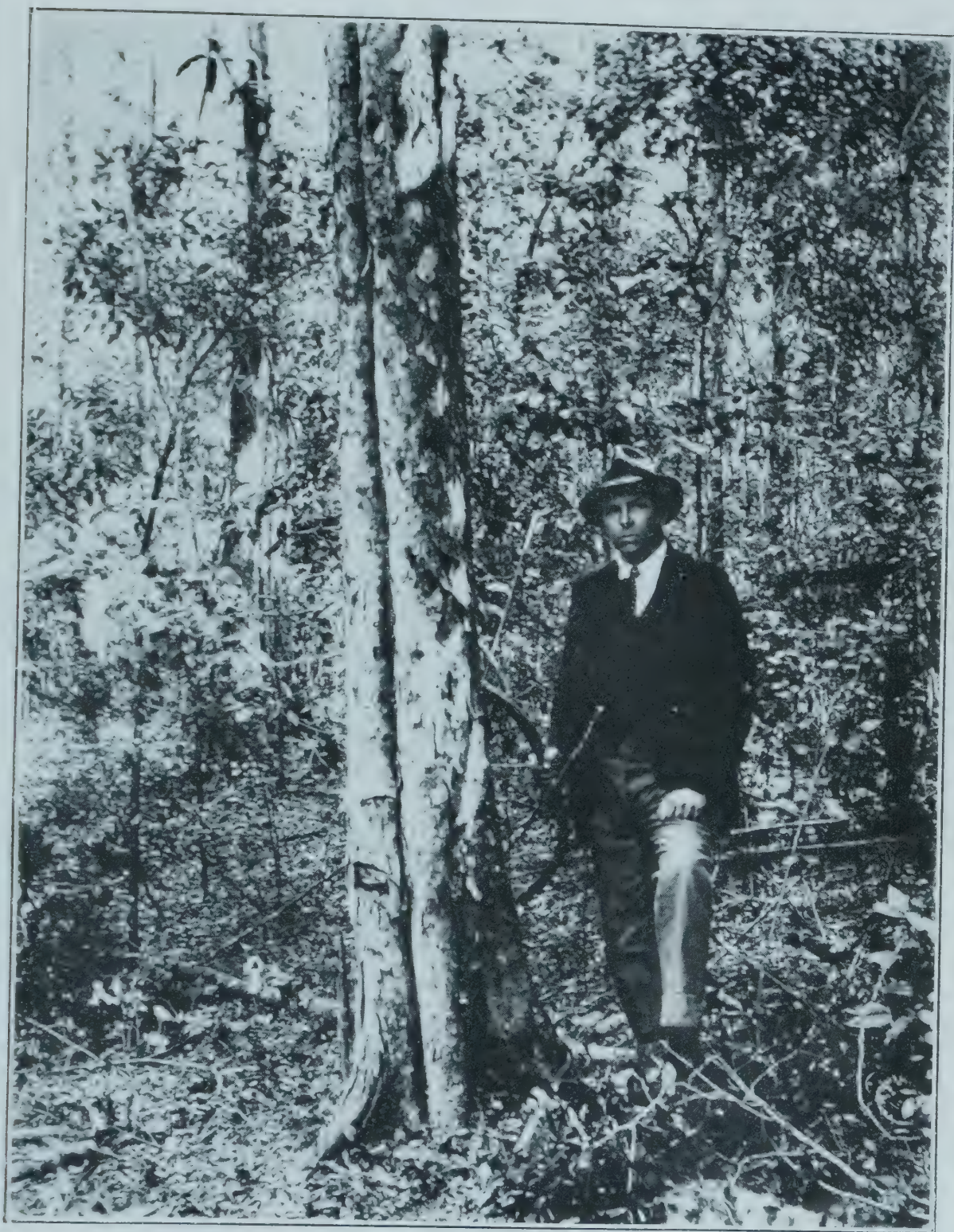


Photo. : W. D. Francis.]

PLATE 133.—GREY HANDLEWOOD, *Aphananthe philippinensis*.
A tree in the "scrub" near Goodna.



PLATE 134.—GREY HANDLEWOOD, *Aphananthe philippinensis*.
A, flowering twig; B, fruit-bearing twigs; C, coppice shoot.



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THE ALGAROBA OR MESQUITE TREE IN CENTRAL QUEENSLAND, *Prosopis juliflora*.

G. B. BROOKS, Senior Instructor in Agriculture.

REFERENCE has been made in previous issues of the "Queensland Agricultural Journal" to this tree, the pods of which are of considerable value as a stock fodder. As showing the interest readers of the Journal take in the subject-matter appearing therein, as a result of an article contributed by the writer on the Algaroba, over 300 applications were received for seed.

This particular distribution was made just prior to the 1902 drought. Many reports have been received from applicants in which they have advised that they either failed to germinate the seed, or were unfortunate in that through adverse conditions the plants perished after transplanting.



PLATE 135.—ALGAROBA BEAN TREE, GROWING OPPOSITE WINTON CLUB, WINTON.

Planted 1921, from seed brought from Honolulu. Note height of tree as compared with the post beside it. (Photo. taken 6th March, 1927.)

Subsequent distribution of seed was made by Dr. Reid, of Cairns; and by Mr. Fergus McMaster, Winton. In a communication received from Mr. McMaster it would appear that his efforts to establish this useful tree in Western Queensland are meeting with much success. He says:—"I am herewith enclosing snaps taken of the Algaroba trees growing in the streets in Winton. These are trees from the seeds brought by myself from Honolulu and the trees were planted early in 1921. They have grown exceptionally well and practically without assistance from water, and being planted as they are on a kind of embankment they get very little assistance from what little rain is sent Winton way. The trees are very popular, and I dare say I have distributed 3,000 seeds this year from the trees growing on this place and those at Devoneourt, and the other day I had application for more seeds. Many

of the graziers are planting them about their homesteads. The way that the trees have grown during the last few years, with the sub-normal rainfall that we have had, leads me to believe that over a series of years, when they would have the advantage of heavier rains, the trees would be valuable both as shade and fodder trees."

In addition to the fifty trees planted at Winton the Algaroba is fairly well distributed throughout the Central Coastal areas. Several trees are to be found in the Gladstone, Baroom, Mount Larcom, Alton Downs, and Rockhampton districts.

From their rapid development when planted in uncultivated land, it is evident that conditions of soil and climate are well adapted to their growth.

The Algaroba usually comes into bearing at the age of four years, when a fair crop of pods is produced. In subsequent seasons the production increases very considerably with the size of the tree.

In the accompanying photographs the respective ages of the trees are, Alton Downs, six years; Pink Lily, five years; and Winton, six years.



PLATE 136.—ALGAROBIA BEAN, PLANTED AT WINTON IN 1921, FROM SEED BROUGHT FROM HONOLULU.

The tree on the right is an *Acacia*, planted about 1905. This *Acacia* is looked upon as a good tree and this particular one has had considerable attention which the Algaroba has not had. (Photo. taken 6th March, 1927.)

The pods commence to ripen during early summer and drop to the ground when mature. A valuable characteristic is that the tree remains in bearing for a period of some four months.

As evidence that the cattle relish the beans the grower of the tree at Pink Lily, Mr. Edminstone, mentioned that his cows on leaving the milking sheds in the morning go direct to the Algaroba tree and pick up the beans that have fallen overnight. One heifer was so fond of them that she invariably camped under the tree all day and fed on the pods as they dropped.

Characteristics of the Algaroba.

In addition to its economic use it is ornamental, and also of value as a shade tree. In regard to its natural habit Mr. L. H. Bailey, Cornell University, in dealing with forage plants, says:—"This small tree is the most common woody plant of the South-western arid region. It is often found in groves with a short trunk like an

apple-tree. It is very valuable as a honey plant, as its period of bloom extends over two months. Its forage value lies in the pulpy edible pods, which are 6 to 10 inches long, containing about a dozen hard seeds."

The pods are very nutritious and are eaten by natives and travellers as well as by stock. The bean pods and bark are rich in tannin. The seeds are said to be the next in value to barley for fattening horses, cattle, sheep, and hogs.

Baron von Muller, in his work on "Select Extra-Tropical Plants," gives the following analysis:—"25 per cent. to 25 per cent. grape sugar; 11 per cent. to 17 per cent. starch; 7 per cent. to 11 per cent. protein; 14 per cent. to 24 per cent.



PLATE 137.—ALGAROBIA BEAN, PLANTED AT WINTON 1921, FROM SEED BROUGHT FROM HONOLULU. (PHOTO. TAKEN 6th MARCH, 1927.)

organic acid, pectin, and other non-nitrogenous nutritive substances. They are also comparatively rich in potash, lime, and phosphoric acid."

The timber is very hard and durable, resembling *Lignum Vitae*, and takes a polish like mahogany. Fences made of this timber have been known to stand in a perfect state of preservation for more than fifty years in Southern Texas.

A description and illustration of the Algarobia were given by the Government Botanist (Mr. C. T. White) in the "Queensland Agricultural Journal" for June, 1921. It is described as:—

"A tree attaining from 60 to 70 feet, branches usually armed with straight spines, either solitary or in pairs. Leaves bi-pinnate, usually occurring in little tufts or fascicles, pinnae 1, 2, or rarely 3 pairs; leaflets usually 10 to 12 pairs, oblong,

3 to 4 lines long. Flowers small and numerous, borne in long slender spikes of 3 to 5 inches. Pod yellow, shortly stalked, 5 to 8 inches long, marked between the seeds with transverse lines, fleshy with a sweet, sugary, more or less spongy pulp; seeds light brown, enclosed in a hard, parchment-like casing (endocarp).

“A native of South America, West Indies, Central America, Mexico, and the Southern United States.”

It is now widely cultivated in tropical countries as a fodder and ornamental tree. Speaking of its introduction into the Hawaiian Island, J. F. Rock in the “Leguminous Plants of Hawaii,” states:—The Algaroba is the most common as well as the most valuable tree introduced into the Hawaiian Islands. All the waste lands, which previous to the introduction of this valuable tree were absolutely barren, are



PLATE 138.—ALGAROBA BEAN TREE, PLANTED AT WINTON 1921, FROM SEED BROUGHT FROM HONOLULU.

The tree on the left is a Cedar, and probably 25 years old, growing under the same conditions as the Algaroba. (Photo. taken 6th March, 1927.)

now covered with green forests made up exclusively of this tree. The tree was introduced by Father Bachelot in 1828, the seed having come from the Royal Gardens at Paris, France.

Propagation.

Seeds should be sown in the spring or early summer. The pod contains up to about twenty seeds. Each seed is surrounded by a hard parchment-like casing. This should be removed with a sharp knife before the seeds are sown. C. S. Judd, writing

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Mr. G. A. Wright, Armidale, writes—

"The best and most practical expression we can give of our opinion of your product we have already given—that is, continued use and repetition of orders.....We have used nothing else for more than five years."

Mr. Wright has used over 500 tons for his stock in about six years.

Mr. Frank Mering, Burghersdorp, South Africa, writes—

"Although I am always tardy in giving Testimonials, I have no compunction in saying that I have used Vita-Lick for three years and that my stock have greatly benefited. I consider Vita-Lick an excellent all-round Lick for all classes of stock."

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SYDNEY



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in a recent number of the "Hawaiian Forester and Agriculturist," found that pouring hot water over the seeds and letting them soak for twenty-four hours greatly accelerated their germination, but they may be sown without any treatment at all, germination then, however, being considerably slower. They should be sown in pots or boxes, and when strong enough the young trees can be planted out into their permanent quarters.

This tree succeeds well in the Brisbane district and fruits well. It is doubtful if it would succeed much further South, as it is more particularly adapted for growing in the warmer parts of the State.

A Good Fodder Plant.

In view of the prominence that has been given recently to the matter of providing fodder supplies to tide stock through dry periods, more particularly in our western areas, it is somewhat remarkable that more attention has not been given to the propagation of trees and shrubs that provide edible material. It would appear that this subject is receiving some attention in the United States of America.



PLATE 139.—AN ALGAROBA TREE. MR. J. EDMONSTONE'S PROPERTY AT PINK LILY.

The Honey Locust Tree.

In the September, 1926, issue of the "Journal of Heredity," a publication devoted to plant and animal breeding, a prize of 50 dollars is offered for the discovery of the best honey locust tree. The explanation given for carrying out such a contest is of much interest and worth quoting:—

"WHERE ARE THE BEST HONEY LOCUST TREES?"

"We need to have trees on our hills, and crops on our trees—crops to harvest every year—a *tree crop agriculture*. We can have this by applying known science and a little common sense to some of our native trees. In the eastern United States is the Honey Locust, a neglected tree of great promise. Its bean and pod have an

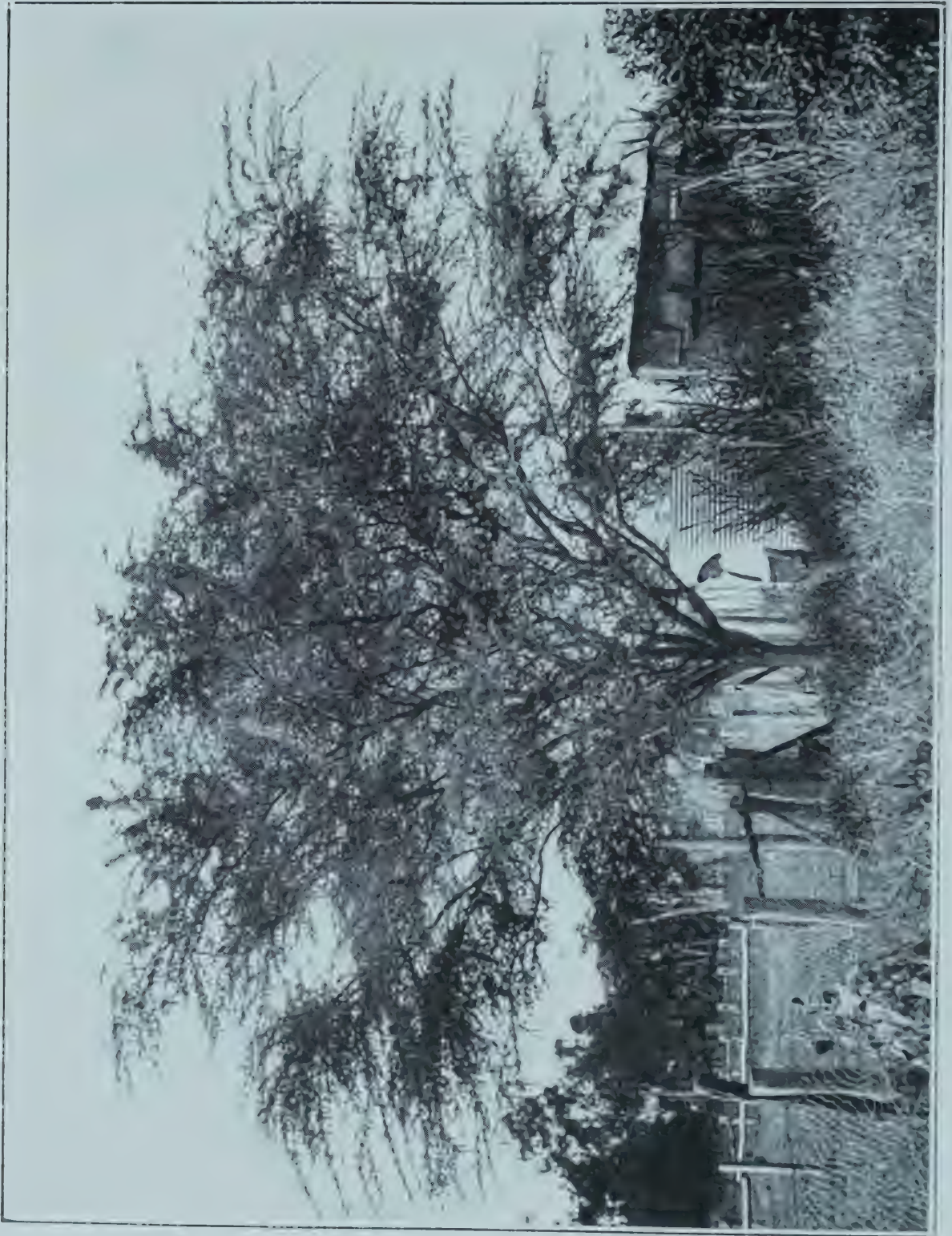


PLATE 149.—AN ACACIA TREE AT ALTON DOWNS, QUEENSLAND.

analysis as good as that of many commercial grain feeds. Cattle eat the beans of some trees greedily. Trees are known that bear many bushels of beans.

"Here is a possible crop of great value, both as a harvest and as a soil saver through letting tree roots stop gullies. We need to have the best wild trees with which to begin, just as the naval orange business began with finding one tree that happened to bear that kind of fruit.

"Enter this contest and help to start a Tree Crop Agriculture in America."

In the last issue to hand (May, 1928) is an account of the Honey Locust contest, with photographs of the winning trees and pods. Reference is made in the article to the Algaroba stating—

"That the United States Department of Agriculture, in 1923, made extensive milling tests to determine its feeding possibilities. By separating the seeds and the pods (which contain the sugar-bearing tissue) it was possible to make two kinds of meal—one high in sugar, and the other in protein. Actual feeding tests with the mesquite in the South-West and Hawaii have proven its value as a stock feed. In fact, in Hawaii the mesquite, which was introduced in 1828, has assumed an important place in the agriculture of that island.

"The pods are everywhere recognised as one of the most important grain feeds of the islands, and are greatly relished by all kinds of live stock, including chickens. The feeding value of the beans has long been recognised from the practical results obtained. As a feeding material there seems to be only one objection to them, and that is a slight flavour given to milk when fed in excess to the dairy cows. The objection could, however, be overcome by feeding the beans after milking rather than before milking."

The result of the mesquite bean contest was so encouraging that a new contest is being arranged to learn whether trees can be found that exceed those prize winners in yield, hardiness, and food contest.

THE FAT LAMB.

Grow Fodder Crops.

Over the bulk of the State where fat lambs are raised, an autumn lambing is found the best, but in the cold districts of the State the lambing takes place in the spring, and the lambs grow during the summer; so that suitable summer crops should be selected and sown to supplement the natural pastures and stubble. In these cold districts fodder crops or extra feed will have to be supplied to produce a satisfactory export lamb, as, besides the fact that the natural pasture in these districts is not of the best, the climatic conditions tend towards slow maturity and a small-framed animal.

In average seasons in the western and south-western districts there is usually sufficient rain in the autumn to ensure a certain amount of growth in the pastures, but for the raising of fat lambs this feed should be supplemented by green fodder crops. In this way every opportunity is given the lamb to get a fair start. The crop should be ready for the ewes to be put into just prior to lambing. This will increase the milk supply, and if alternated with natural pastures there should be abundant feed until the usual spring growth, when the fodder crop can often be allowed to grow up for hay or silage.

Suitable Crops.

In deciding what crops to grow for fodder, the general farm practice should be considered. It should be made to work in as part of a rotation of crops on the farm, and for that reason a crop other than wheat is advisable. Of those available, the most satisfactory is oats, which, besides being an excellent fodder, helps to control such wheat diseases as "take-all," &c. There are several early varieties which should give excellent results, and which provide more feed, perhaps, than Algerian, but the latter is very satisfactory.

Skinless barley is another fodder crop recommended, and it provides particularly good feed. Rape, or a mixture of rape and barley, will give a great bulk of feed if the season is suitable for a good germination of the rape seed. Rape alone should be fed off with care or losses may occur from "hoven." Lucerne and Sudan grass are two other very valuable fodder crops which the wheat farmer, who combines the fat lamb business with his farming, should find little difficulty in fitting into a suitable rotation.—"A. and P. Notes," N.S.W. Department of Agriculture.

FLUSHING THE BREEDING SOW.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

In perusing the pages of several of the older established text-books on "Animal Husbandry," one frequently comes across the term "flushing" as applied to "flushing the mare" or the ewe or the sow or cow or as the case may be, in each instance prior to the time the female is mated.

This "flushing" is not a common term in Australian live stock literature nor is it a regular practice on our farms, consequently an explanation of the term "flushing the sow" before mating will be of interest to readers of this Journal.

The term flushing simply means a general stimulation of the whole of the internal organisation of the animal, the object being to increase the number of pigs produced at farrowing time. The purpose is accomplished by increased feeding of grain or by the use of fresh or more succulent pastures than have previously been available.



PLATE 141 (Fig. 1).

Duroc-Jersey sow "Lawn Hill Lorna" and a group of her "ton" litter of ten pigs which (not including the sow), weighed 2,000 lb. live weight when one week less than six months old. They were exhibited at the recent Royal National Show at Brisbane by Mr. Percy V. Campbell, of Lawn Hill, Lamington, Queensland, and created considerable interest. This litter indicates what can be done by properly flushing the sow and keeping the feed up to the young pigs from birth. See also Fig. 2.

The practice is understood and practised more by the sheep man than by the breeder of pigs or of most of the other classes of live stock; still it is a well recognised old time as well as modern practice. The sheep man practises it by turning the breeding ewes into a fresh succulent pasture just prior to "joining the rams," the time when the ewes are to be mated, the objective here being to secure a larger percentage of twins or a higher general average at lambing time.

There is no reason why the pig breeder should not adopt the same practice with his breeding sows, especially with sows that are advancing in age and that might otherwise produce rather unsatisfactory litters.

The most beneficial results are obtained when the flushing begins two or three weeks before the breeding season opens or the stock are to be mated. Supposing that the sows have been running on pasture alone during the greater part of the "off" season; at the beginning of the breeding season, or when it is desired to prepare the sows for mating, they should be turned into a fresh patch of rape, lucerne, or other green stuff that would furnish



PLATE 142 (Fig. 2).

Representatives of the Ton Litter of Duroc-Jersey pigs exhibited at Brisbane Show, August, 1928. Note good type, quality, and evenness throughout.



PLATE 143 (Fig. 3).

Group of Duroc-Jersey Berkshire Cross pigs, winners of the Litter Weight Contest at the Brisbane Show, 1928. That it pays to follow the practice of flushing the breeding sow is again evidenced in this photograph. Bred and exhibited by Mr. Percy W. Campbell, of Fern Hill, Lexington.

In the case of a single sow, the breeder might begin by feeding a slop composed of milk and barley or wheat or maize meal, &c., and give more than the usual supply of green food. The idea is to stimulate the whole system without putting on any great amount of fat. It is, of course, expected that the animals will begin to gain a little more rapidly in early spring or as the breeding season opens, and the majority of breeders will see to it that their stock put on flesh at this time, but it is important that the sows should be in medium breeding condition only and be gaining in weight and flesh at the time when they are mated. After the sow has been mated, continue the practice for a week or two before turning her out to pasture again.

All sows should, of course, be kept in good breeding condition during the gestation period, but there is no necessity that they should be "rolling" in fat.

Care should also be taken to see that as soon as possible after service the sow is removed from the boar's pen and placed in a clean pen away from other sows or boars for at least five or six hours, during which she should be liberally fed and kept quiet and in a comfortable condition. It is quite impossible to expect good results by allowing innumerable services and by allowing other sows, mated or otherwise, to interfere with the newly mated sow.

Attention should be paid to these details for the purpose of obtaining better and stronger litters. Many breeders who were not altogether sure about this "theory" in stock breeding have been favourably impressed. Further, the additional care exercised protects the boar and enables him to mate with a larger number of sows with more reliable results than would be possible if the mating were neglected.

Pig production costs are so high these days that no effort should be spared to ensure the production of larger and more vigorous litters. It is quite evident that farmers who have given the most attention to the system of "flushing" above referred to are its most constant advocates.

PRECAUTIONS AGAINST SWINE FEVER.

The most potent factor in the spread of swine fever among pigs is undoubtedly the infected pig, which may even pass on the disease to others several days before symptoms are exhibited, says Major C. G. Saunders, in an interesting article in the current issue of the "Pig Breeders' Annual." It must also be remembered that this infectiousness remains during the whole course of this disease. The virus of the disease is also spread through the medium of urine, fæces, eye and nasal discharges; and the floors, bedding, and manure in the pens or stys where infected pigs are housed become saturated with the virus which may be carried from one farm to another, or to different parts of the same farm on the feet of men and animals, or on the wheels of vehicles, and probably by birds. Stock attendants may also, by medium of their hands and any instruments or tools they may use, be the means of spreading the disease far and wide. The chief danger is, however, the infected pig, and attention is specially drawn to the fact that unthrifty pigs may have swine fever without showing any definite symptoms of the disease, and may be moved from one farm to another under the impression that they may only be suffering from some non-contagious disease. Another danger is the pig that has apparently recovered from the disease but is, in reality, suffering from it in a very chronic form, as such pigs may be infective to others for eighty days or longer. Carcasses of pigs which have died from swine fever may retain the virus for months, and even cured meats are not always safe in this respect. Hence the necessity of boiling all offal and garbage before feeding to pigs.

The following precautions will reduce the danger of an outbreak of swine fever:—

- (1) Quarantine all newly purchased stock and all pigs returned from show or market for three weeks in a remote section of the farm, and admit to the main herd only after careful scrutiny has revealed nothing suspicious.
- (2) Locate pig yards and stys away from streams, highways, and keep strangers away from them, and especially pig dealers and persons who have unthrifty pigs upon their premises.
- (3) Buy only from herds that are known to be healthy.
- (4) Do not visit a farm where there are sick or unthrifty pigs.
- (5) Cook all swill and offal before feeding, and make the man that has handled the raw material disinfect himself immediately after.
- (6) After an outbreak of swine fever see that all carcasses are burned or buried deeply with quicklime.

It is well to remark here that in Australia stock regulations compel pig breeders to immediately report to the nearest stock inspector, police officer, or other Government official any suspected outbreak or serious trouble amongst pigs, and to carry out the instructions issued by these officers so that there will be no possible chance of disease spreading from herd to herd. Heavy penalties are imposed upon those who neglect or fail to carry out instructions issued under the Acts controlling these diseases, and the premises concerned may be quarantined for whatever period is deemed necessary. There is everything to gain and nothing to lose by reporting the matter immediately if it is suspected there is anything seriously wrong with the pigs. The Departments of Agriculture in the various States will supply all information relative to these matters upon application free of cost. In any case it would be very unwise to introduce other pigs into such premises that were suspected of being infected until the matter was cleared up and only healthy stock remained on the property, and all buildings and stys, yards, paddocks thoroughly cleansed and freed of infection.—E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

PIG RAISING.

COSTS OF PRODUCTION VARIES.

The cost of producing pork varies widely on different farms. Cost records for a period of five years on representative farms in Greene County, Ohio, United States of America, kept under the direction of John F. Dowler, Assistant in Rural Economics, Ohio Experiment Station, show variation on the different farms ranging from 6.50 dollars to 15.02 dollars for each 100 lb. of pork.

The farms that were most successful in the production of pork seemed to have a number of managerial practices in common, which resulted in lower cost. The sows were well fed before farrowing. Separate houses or shelter-sheds were provided for each sow, and these were placed on new pasture or ground each season.

The young pigs were kept away from straw stacks and feed lots about the barns and other buildings. They were given the run of large fields for pasture in summer and exercise in winter.

Much labour was saved by hogging down corn, using self-feeders, and feeding unhusked corn in the fodder. Plenty of drinking water was provided at all times, and it was prevented from freezing in winter.

Preventive measures were taken against cholera, and treatments were given for the round worm. The pigs were given comfortable quarters, and were kept thrifty and contented from the start.

On the whole, the farms with high cost of pork production were less efficient in feeding and care, and required more labour and larger amounts of feed per unit of gain. The sows on these farms were often too fat or too poor. Straw stacks, stables, and other unsuitable places were often provided for the farrowing sows, and most of the pigs were fed around the barn and in feeding-lots that could not be ploughed.

CHOOSING A DAIRY BREED.

By C. F. McGRATH, Supervisor of Dairying.

The question of what breed of dairy cattle is the best has been asked by a number of persons either about to enter or engaged in the dairy business.

It is not so much the question of breed that requires consideration as does the question of profitable producers.

There are good dairy animals that are profitable at the pail in all dairy breeds, and it is true also that poor producers are found in each breed. The selection of animals within the breed chosen is the matter of most importance. The breed chosen should be the one that appeals to personal taste, and that is suitable to the conditions under which the animals are to dairied. Any one of the dairy breeds are worthy of a place on our dairy farms.

The sure way to determine the dairy animal's value is to test it for production. The progeny of animals whose production has been recorded should be secured when possible. The milk producing trait is hereditary, and selected females should be bred to sires with production on paternal and maternal sides.

Answers to Correspondents.

Supplying Phosphorus for Cattle.

“FARMER” (Gordonvale)—

There is no need to bother about bone meal as supply of phosphorus for cattle, as we have in crushed Nauru phosphate a cheaper and richer source of phosphoric acid. Make a mixture of one part of coarse salt and two parts of crushed Nauru phosphate, and give the cows about 3 oz. of this mixture in their food every day. Some of the mixture can also be left in addition in troughs, so that the animals can get more if they want it.

BOTANY.

The following replies have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Specimens Determined.

“DESIROUS” (Clear Mountain)—The specimens forwarded with your letter of the 8th instant have been determined as follows:—

- No. 1. *Eugenia Ventenatii*. Weeping Myrtle. Family Myrtaceæ.
- No. 2. *Dysoxylum rufum*. A small or medium-sized tree, for which I have not heard a common name. It is allied to the Rosewood and Red Bean. Family Meliaceæ.
- No. 3. *Litsea dealbata*. Family Lauraceæ. Allied to the Camphor Laurel.
- No. 4. *Backhousia myrtifolia*. Carrol.
- No. 6. *Nyssanthes diffusa*. A “Needle.” Family Amarantaceæ.
- No. 7. *Verbena bonariensis*. Purple Top.
- No. 8. *Commersonia echinata*. Brown Currajong. Family Sterculiaceæ.
- No. 5 (but no number on label).—*Solanum auriculatum*. Called Wild Tobacco. Family Solanaceæ. A native of South America naturalised in Queensland. A similar plant with white flowers—*Solanum verbascifolium*—overruns scrub farms in the same way.

Marsh or Yellow Watercress.

J. McG. (Moombra)—

The specimen forwarded with your letter of the 21st instant is *Nasturtium palustre*, the Marsh or Yellow Watercress, a soft, rather succulent, weed of the cress family (Cruciferae), widely spread over the temperate regions of the world. It has no particular value as a fodder, and like most cruciferous plants, would taint the milk of dairy cows feeding on it.

Freshwater Algæ.

A.H.W. (Laidley)—

The green growth in your dam represents a heavy growth of freshwater algæ. The method of dealing with freshwater algæ in dams and ponds is, when they are surface species, to spray the surface with Bordeaux mixture of half the usual strength. Bordeaux mixture can be obtained in tins in concentrated form from most of the nurserymen.

For submerged algæ, copper sulphate may be put in a coarse sack and dragged backwards and forwards from the bank, or towed up and down in a boat, until it is all dissolved. Copper sulphate is poisonous, and for the water to be safe for water birds and for drinking purposes by man or animals, the copper sulphate must not exceed 1 part in 1,000,000 parts of water by weight (i.e., 1 lb. in 100,000 gallons): The contents of the pond may be estimated by roughly calculating the cubic capacity in feet, and multiplying the result by 6½. This gives the number of gallons, and a division by 100,000 gives the lb. of copper sulphate required. A second application should be made a week or two later.

Algæ give a good deal of trouble in ornamental ponds in colder countries, such as England and the Continent, but here they commonly seem to die with the approach of hot weather.

PIG RAISING.

Replies selected from the outgoing mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.

Isolation of Sick Pigs.

J.A.H. (Winegrove)—

The use of cod liver oil in the treatment of pigs affected with a peculiar trouble in the ear is specially recommended. This trouble causes the pig to carry its head on one side and to lose condition. The oil appears to have a very beneficial effect, but it must be carefully handled, care being taken that each pig receives its proper share. The isolation of sick pigs away from healthy stock and special treatment while isolated is always recommended. All treatment must be accompanied by a thorough cleansing of the surroundings, and an improvement in the methods of housing and feeding, for the appearance of disease of this description in the herd is a sure indication that there is a deficiency of mineral matters and vitamins in the food. The supplying of green food, charcoal, bone meal, protein or meat meal, and clean drinking water, and the feeding of readily digestible nutritious food are items requiring special attention. The animal should also be forced to take exercise in the sunshine.

Feeding Fruit to Pigs.

T.S.A. (Palmwoods)—

Fruit is of little feeding value for pigs; hence it is not profitable to rely on the products of the orchard as pig food. This is especially so with reference to citrus fruits, for the pig only consumes the juice. Pigs consuming large quantities of fruit are subject to certain gastric troubles, particularly if the food is fed in an overripe or damaged condition, or in too large a quantity at a time. Small quantities of fruit can be used to advantage when fed with other more concentrated foods, such as barley meal or pollard.

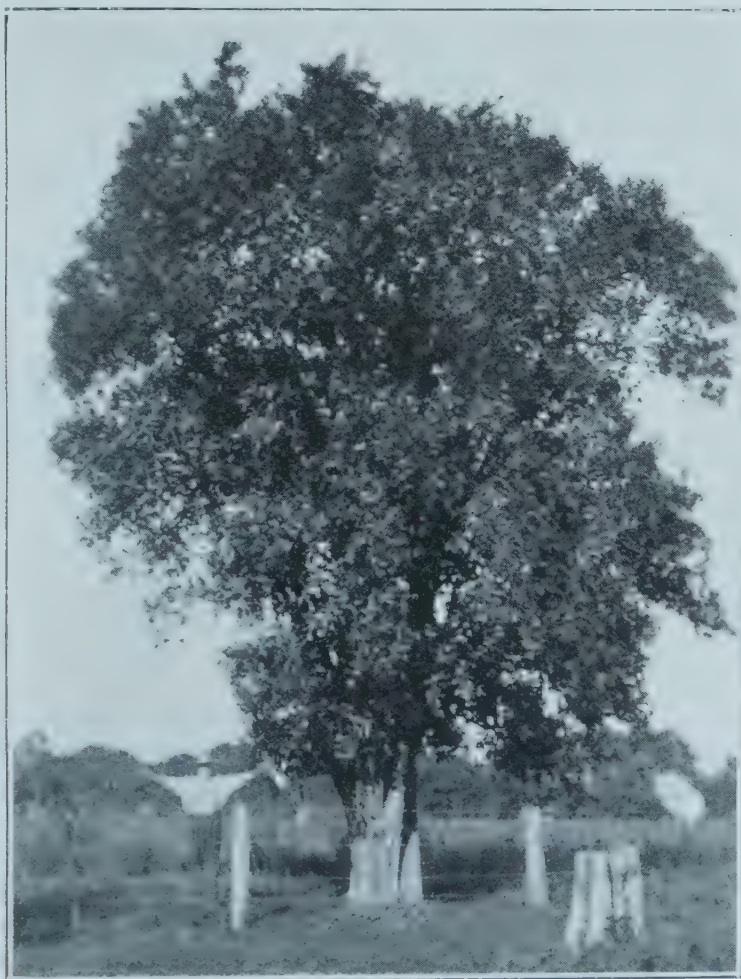


PLATE 144.—W. HENRY'S SEEDLING ORANGE TREE GROWING AT MOORLAND, N.S.W.

Height, 33ft.. greatest limb spread, 36 ft. 9 in.; Girth, 3 ft. up trunk, 8 ft. 3 in.; Narrowest Girth, (1 ft. up trunk) 7 ft. 2 in.; Approximate Crop, (1928) 20-25 bushels.

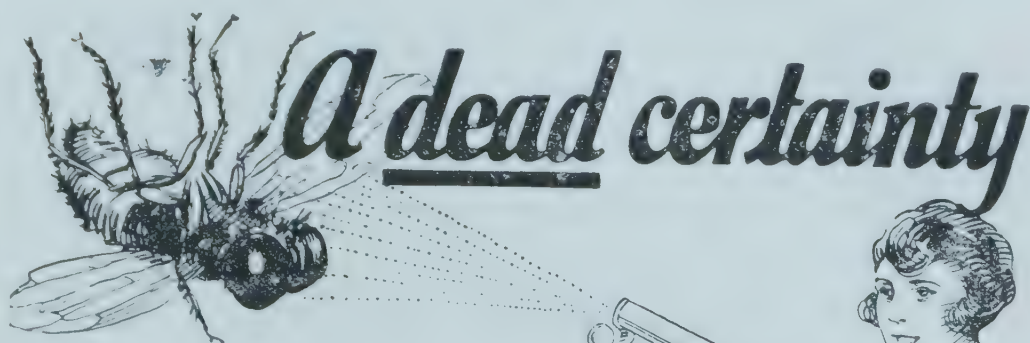
BANANA PROPAGATION.

There is an impression amongst many banana growers that where the plants are raised from the single eye, as is done at the State Nursery at Bribie Island, the quality of the fruit is not equal to that obtained from a well-developed corm or sucker. That this is not the case has been proved by samples of Cavendish fruit recently submitted to this Department, which were $9\frac{1}{2}$ inches in length by $5\frac{1}{2}$ inches in girth, and the largest of which weighed nearly $\frac{1}{2}$ a pound. (See Plate.) Further confirmation is also to hand from a grower at Marian, near Mackay, to whom a number of small banana plants, raised from the single eye at the Bribie Nursery, was sent a couple of years ago. The writer states:—"It may interest you to know the suckers you sent me have done remarkably well, and as we have this season grubbed up a number of them and divided the clumps and planted same we are in a position to state that they are absolutely free from beetle borer or any other disease. This encourages us to extend." This information is very satisfactory, as it shows that even where clean banana plants are set out in a beetle-infested area there is a chance of their keeping free of this pest for some time.—GEO. WILLIAMS, Director of Fruit Culture.



PLATE 115.

A "HAND" OF CAVENDISH BANANAS FROM A PLANT RAISED FROM THE SINGLE EYE, AS PRACTISED AT THE STATE NURSERY, BRIBIE ISLAND. (See note on Banana Propagation.)



HOUSEWIVES the world over are in ever-increasing numbers turning to FLY-TOX as the guardian of Health, Comfort, and Hygienic Cleanliness. Its searching spray brings instant death to all verminous and disease carrying insects.

Its use ensures food being free from fly-contamination, and long, restful nights, immune from the exasperating bites of the dangerous mosquito.

FLY-TOX
"Kills 'em Dead"

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Power Economy Reliability

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POWER output, reliability and economy are the three fundamental factors which decide the merit of a power Kerosene. In practice you will find that Cross possesses a decided superiority in all of these factors, and proves to be, under hard practical conditions, the most suitable fuel in every way for tractor farming.



CROSS KEROSENE

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General Notes.

Staff Changes and Appointments.

Mr. G. Sutton, of Camp Mountain, Samford, has been appointed Honorary Inspector under the Diseases in Plants Acts.

Mr. F. J. Watson, Dairy Instructor, Bundaberg, has been attached to the Brisbane District, and Mr. C. L. Moran, Dairy Instructor, to the Toowoomba District.

Transfers of the following Inspectors of Stock have been approved:—Mr. S. C. O. Jessop, from Crow's Nest to Helidon; Mr. S. J. Monaghan, from Julia Creek to Crow's Nest; Mr. L. P. Doyle, from Clonecurry to Julia Creek.

Mr. G. R. I. Anderson, Inspector of Slaughter-houses, Innisfail, has been appointed also Inspector of Stock and Brands.

Mr. F. G. Marks, of Alberton, has been appointed Officer under and for the purposes of the Animals and Birds Acts.

The resignation of Mr. W. B. Smith as Sales and Possessions Officer, Agricultural Bank, has been accepted as from 17th October, 1928, and Mr. Smith has been appointed Inspector, Agricultural Bank, as from 18th October, 1928.

The resignation of Mr. A. W. Burne as Cinematographer, Chief Office, has been accepted, as from 31st October, 1928, as tendered.

The following have been appointed Members of the Southern District Stallion Board:—Messrs. A. H. Cory, M.R.C.V.S., E. Baynes, P. Short, and J. Sprott.

Mr. J. Harold Smith, M.Sc. (Agric.), Assistant to Entomologist, Cairns, has been appointed Assistant Entomologist, as from 22nd August, 1928.

Messrs. F. C. Shaw and P. J. Short have been appointed Temporary Inspectors of Stock, as from 13th and 31st August, respectively.

Mr. J. R. McKinstry, Inspector of Stock, Helidon, has been appointed Officer in Charge, Tick Cleansing Area, South Burnett, with headquarters at Kingaroy.

The appointments of Messrs. A. Dick and S. C. Smith, Inspectors of Slaughter-houses at Ayr and Mareeba, respectively, have been confirmed, as from 20th February, 1928.

Constable N. T. Briskey, of Clermont, has been appointed Inspector of Slaughter-houses.

Messrs. H. G. Springer and W. J. Adderley, of Wolvi, via Gympie, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. W. R. Winks, B.Sc., Assistant to Analyst, has been appointed Analyst, Agricultural Chemical Laboratory, as from 10th September, 1928.

It has been approved that the designation of the present position of Instructor in Agriculture be changed to that of Senior Instructor in Agriculture, and Messrs. G. B. Brooks, A. E. Gibson, and N. A. R. Pollock, Instructors in Agriculture, have been appointed Senior Instructors in Agriculture, as from 1st July, 1928; that the designation of the position of Instructor in Pig Raising be changed to that of Senior Instructor in Pig Raising, and Mr. E. J. Shelton, Instructor in Pig Raising, has been appointed Senior Instructor in Pig Raising, as from 1st July, 1928; that the designation of the position of Instructor in Sheep and Wool be changed to that of Senior Instructor in Sheep and Wool; the designation of the position of Assistant Instructor in Sheep and Wool be changed to that of Instructor in Sheep and Wool, and Mr. Jas. Carew, Assistant Instructor (and Acting Instructor) in Sheep and Wool has been appointed Instructor (and Acting Senior Instructor) in Sheep and Wool, as from 1st July, 1928.

The Officer in Charge of Police, Millmerran, has been relieved of his appointment as Acting Inspector under and for the purposes of "*The Diseases in Stock Act of 1915*," as from 31st October, 1928.

Mr. L. F. Reinke, of Monto, has been appointed Officer under and for the purposes of the Animals and Birds Acts.

Mr. L. B. Christian, of Waterloo, Yandaran, has been appointed Honorary Inspector under and for the purposes of the Diseases in Plants Acts.

Mr. E. C. Olive, Manager of the State Farm, Kairi, has been appointed Dairy Instructor, Department of Agriculture and Stock.

The Inspector of Stock at Gayndah has been appointed Government Representative on the Burnett Dingo Board.

Mr. C. F. Adermann, of Wooroolin, has been appointed Chairman of the Peanut Board.

Mr. F. C. Coleman, of Grantham, has been appointed Inspector of Dairies, as from the date of taking up duty; his appointment is on probation for a period of six months.

Mr. T. Raymond, of Mirriwinni, Gordonvale, has been appointed an Officer under and for the purposes of the Animals and Birds Acts.

Pastoral Districts Visited—Proposed Tour of South Western Queensland.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) stated that, in pursuance of the policy of the Government to make the services of qualified technical officers available to the pastoralists and agriculturists, he had recently arranged for a tour of the Northern and Western cattle and sheep districts by the Agricultural Chemist (Mr. J. C. Brünnich) and the Instructor in Sheep and Wool (Mr. J. Carew). Addresses were delivered by these officers, and were apparently greatly appreciated by the stockowners. Lectures were arranged for at Charters Towers, Ashton, Hughenden, Winton, Isisford, Longreach, Springsure, Emerald, and Capella, and these lectures were well attended by owners concerned. In the course of the visit to these districts much information was obtained in connection with the use of licks and the artificial feeding of sheep and lambs, and this information will be utilised in publications proposed to be issued by the Department on the sheep industry.

Orchardists and dairymen were also visited in the Charters Towers district, and the departmental officers were consulted on many problems incidental to their activities.

Arrangements have been made for Messrs. E. H. Gurney, Senior Analyst, and J. Carew, Instructor in Sheep and Wool, to make a similar visit to the South-western areas of the State, and it is intended that these officers should leave Brisbane on the 5th November. In the course of their tour the following districts will be visited on the dates mentioned:—Jondaryan, 5th November; Dalby, 6th to 8th November; Miles, 8th to 10th November; Roma, 10th to 13th November; Mitchell, 13th to 17th November; Charleville, 17th to 24th November; Cunnamulla, 24th to 28th November; St. George, 28th to 30th November; Goondiwindi, 30th November to 3rd December.

On their return they will visit other Downs centres, and are expected to return to Brisbane about the 6th December.

In connection with these visits, the Minister expressed his appreciation of the excellent arrangements made by pastoralists and outlying settlers for the conveyance of the officers through the areas visited.

Wheat Board Election.

The annual election for the appointment of a member for each of the five State Wheat Board Districts was conducted at the Department of Agriculture and Stock with the following results:—

District No. 1 (Maranoa-Dalby)—

Aaron Hoskin (Mount View, via Jimbour)	..	..	..	273 votes
*Robert Swann (Wallumbilla)	..	..	..	120 votes

District No. 2 (Old Pittsworth Electorate)—

Arthur Carl Krieg (Brookstead)	..	..	..	487 votes
*Edward Fitzgerald (Felton)	..	..	..	405 votes

District No. 3 (Warwick-Killarney)—

*Bergittinus C. C. Kirkegaard (Freestone)	..	..	..	286 votes
Thomas Braithwaite (Warwick)	..	..	..	127 votes
Joseph James Booth (Junabee)	..	..	..	60 votes

District No. 4 (Allora-Clifton)—

W. J. T. Neale, Allora (Unopposed)

District No. 5 (Toowoomba and Lockyer)—

*John Archibald (Oakey)	..	..	..	182 votes
Patrick McNee (Kingsthorpe)	..	..	..	126 votes
William Garvey (Gowrie Little Plain)	..	..	..	80 votes
* Retiring member.				

The successful candidates will hold office for a term of one year as from the 1st September.

Levy on Growers of Papaws.

Regulations under the Fruit Marketing Organisation Acts have been approved, empowering the Committee of Direction to make a levy payable by growers of papaws at the rate of 1d. per bushel case of papaws sold by them. The sums raised by the levy shall be expended only upon advertising in the interests of the growers concerned.

Canary Seed Board.

An Order in Council under the Primary Producers' Organisation and Marketing Act has been passed, the effect of which is that the present members of the Canary Seed Board shall hold office only until the 30th November, 1928, instead of 22nd December, 1928. Members appointed from the 1st December, 1928, will hold office until the 28th February, 1930. Nominations will be received by the Returning Officer, until 7th November, 1928, for election as Growers' Representatives on the Canary Seed Board to hold office from 1st December, 1928, to 28th February, 1930. Two such representatives are required.

Sugar Levies.

Regulations under "*The Primary Producers' Organisation and Marketing Act of 1926*" have been approved, providing for levies by the Queensland Cane Growers' Council, District Cane Growers' Executives, and Mill Suppliers' Committees, on suppliers of sugar-cane to mills during the season 1928. The total of the levies per ton of cane supplied to each mill is as follows (total levies for 1927 are given in parentheses for comparison):—Mossman Central, 5½d. (6¼d.); Hambledon, 2½d. (2½d.); Babinda Central, 1½d. (2¼d.); Mulgrave, 1½d. (2¼d.); South Johnstone, 4¼d. (5¼d.); Goondi, 3¼d. (5¼d.); Mourilyan, 3¼d. (5¼d.); Tully River Central, 4¼d. (5½d.); Macnade, 2¼d. (3d.); Victoria, 2¼d. (3d.); Kalamia, 2¾. (3½d.); Pioneer, 2¾d. (3½d.); Inkerman, 2¼d. (2½d.) Invicta, 2¾d. (4d.); Proserpine Central, 3¾d. (4½d.); Cattle Creek Central, 2¾d. (3d.); Plane Creek Central 2¾d. (3d.); Marian Central, 2¾d. (3d.); North Eton Central, 2¾d. (3d.); Pleystowe, 3¾d. (4d.); Racecourse, 2¼d. (3d.); Farleigh, 2¾d. (3d.); Qunaba, 2d. (2¾d.); Bingera, 2¾d. (3d.); Fairymead, 2½d. (3¼d.); Gin Gin Central, 2¾d. (2½d.); Millaquin, 2½d. (2¾d.); Isis Central, 2¼d. (3½d. Booyal, 4d. Pialba); Childers, 2d. (2¼d.); Maryborough, 2½d. (2¾d.); Mount Bauple Central, 2½d. (2¾d.); Moreton Central, 3½d. (4¾d.); Rocky Point, 2¾d. (3d.).

No poll will be taken in respect of the general levy by the Queensland Cane Growers' Council (¾d. per ton), but before the other levies are made, growers are given the opportunity of petitioning, before 1st October, 1928, for a poll to decide whether or not any particular levy shall be made. In the case of the levy of 1d. for a Defence Fund for the Queensland Cane Growers' Council, the petition must be signed by at least 100 canegrowers. In the case of the levies of various amounts for the District Executives and Mill Suppliers' Committees, petitions must be signed by at least 100, or 50 per cent. (whichever shall be the less) of the cane suppliers to any particular mill. The levies by District Executives and Mill Suppliers' Committees will be utilised for administration purposes of the respective Executives and Committees in the respective districts.

Additional Sanctuaries.

By Order in Council under "*The Animals and Birds Acts, 1921 to 1924*," the lagoon and one-mile depth of land surrounding same on the property of Mr. A. J. Hay, Taroom, has been declared to be a sanctuary for animals and birds.

An Order in Council has been approved under the Animals and Birds Acts, declaring the properties of Frank Fraser, Ltd., and of Thomas and Honoria Kirkwood, both properties being in the Herbert River district, to be sanctuaries for animals and birds.

Advances to Maizegrowers on Atherton Tableland.

By Order in Council under "*The Primary Producers' Organisation and Marketing Act of 1926*," the Atherton Tableland Maize Board has been empowered to make harvesting advances (including advances for picking, shelling, and carting) to maize-growers on the Atherton Tableland, on growing crops or on shelled or unshelled maize already harvested but still in possession of the maizegrowers, or on maize delivered to the Board's silos. Such advances shall not exceed £2 per acre of any one grower's growing crops or £2 per ton of his shelled or unshelled maize.

Foxes a Pest in Sugar Districts.

A Regulation has been issued under the Sugar Experiment Stations Acts, making foxes a pest for the purposes of that Act.

For Good Quality Cream.

To make certain of always producing the highest quality of milk and cream, care is essential during all stages of production. The cardinal requisites are enumerated as follows:—

- (1.) Healthy cows and attendants.
- (2.) Wholesome feed and pure water.
- (3.) Strict attention to cleauliness.
- (4.) Prompt cooling.
- (5.) Protection in transportation.
- (6.) Frequent deliveries to factories.
- (7.) Absence of feeds and weeds that produce objectionable odours and flavours.

Victorian "Reso" Tour.

Following on the success of the recent "Reso" Tour of Victorians to Queensland, the Commissioner for Railways (Mr. J. W. Davidson) has received many requests for the organisation of similar tours to Victoria.

In conjunction with the New South Wales and Victorian Railways, arrangements have, therefore, been made for a "Reso" Tour of Queenslanders to Victoria to commence from Brisbane on Saturday, 1st December. The tour, which will occupy ten days from Brisbane to Brisbane, will be confined to men only, and will provide a unique opportunity for Queenslanders to enjoy a personally conducted tour to Victoria and the new Federal Capital.

The organisation of "Reso" Tours, which are run at an all-inclusive fare, is of high standard, and no effort is spared to ensure the comfort and welfare of those participating. Apart from the facilities afforded for inspecting the various industries and resources of the districts visited, Resonians have the privilege of meeting representative citizens, and the resultant interchange of ideas and discussion of mutual interests, which is to the advantage of both parties, has been found to be of inestimable value in bringing about a better understanding and a spirit of closer co-operation between the people of the different States and districts.

The Victorian tour is of particular interest to farmers, graziers, and fruit-growers, the itinerary being specially arranged for their benefit. Preliminary arrangements are now being made for the reception of the visitors in Victoria, and everything possible is being done to ensure a most interesting and enjoyable tour.

The itinerary, as will be seen from the following brief particulars, is most varied and comprehensive in its scope, and is one which should appeal very strongly to Queenslanders.

The Resonians will leave Brisbane by the Sydney mail train on Saturday morning, 1st December, and will spend Sunday in Sydney. Early on Monday morning they will arrive at Corowa, on the Victorian border, a district noted for its sheep and wheat, and in the afternoon they will reach Rutherglen, famed for its vines and wines. On the Tuesday morning the party will visit Shepparton, the centre of Victoria's fertile Goulburn Valley, and one of the largest fruitgrowing areas in Australia. Here is situated one of the most modern canneries in Australia, capable of processing 100 tons of fresh fruit daily. The afternoon will be spent among the sheep and citrus fruits at Echuca, the principal town and port on the Murray, and the centre of a prosperous agricultural area and of a big irrigation scheme. The next day the party will visit Horsham, the heart of the wealthy Wimmera district, and renowned for its wonderful wheat crops, its wool, and fat lambs. On Thursday, 6th December, the morning will be spent among the beef cattle at Hamilton, in the western district of Victoria, and in the afternoon the rich pastoral district of Casterton will be visited. The Resonians will spend Friday, 7th December, in Melbourne, and on the following day they will make an inspection of Canberra, the new Federal Capital City. After a short stay in Sydney on Sunday, 9th December, the party will return by mail train to Brisbane, where they will arrive on Monday evening, 10th December.

The number in the party will be limited to sixty, and the price to be charged for the tour is £45, which includes first class fare by rail, sleeping berths, meals, accommodation, motor car hire, &c. Those desirous of participating in this tour should communicate immediately with the nearest station-master or the Secretary to the Commissioner for Railways.

Diseases in Stock Act.

Orders in Council under the Diseases in Stock Act have been issued, declaring:

- (1) That Westmoreland shall no longer be a crossing-place for stock from the Northern Territory.
- (2). That the Buffalo Fly is and shall be a disease under and for the purposes of "*The Diseases in Stock Act of 1915.*"

The Royal Society of Queensland.

The Ordinary Monthly Meeting was held in the Geology Lecture Theatre on Monday, 27th August, 1928, at 8 p.m.

The President, Professor T. Parnell, in the chair, and about thirty members present.

Mr. L. L. S. Barr and Dr. John Bostock, M.B., B.S., D.P.M., M.R.C.S., L.R.C.P., were elected ordinary members of the Society.

The President referred to the death of Mr. W. R. Colledge, and expressed the Society's appreciation of his work.

Professor H. C. Richards communicated a paper entitled "A Geological Reconnaissance of Part of the Aitape District, Mandated Territory of New Guinea," by H. G. Raggatt, B.Sc., of the Department of Mines, Sydney. The general geographical features of the area are as follow: (1) The Coastal plain is about one mile wide at Ulau, and reaches a maximum of approximately 12 miles at Sissano. It is so little raised that the streams which flow through it inevitably meander as they approach the sea, in some places forming deltas with numerous distributaries. With the exception of Vanimo, there are no deep water bays of importance. (2) The Coastal foothills are a well-defined area between the plain and the main dividing range, and have an average height of about 500 feet. The streams are relatively swift flowing and deeply entrenched. (3) The Dividing Range here does not exceed 5,000 feet in height and is enclosed in thick jungle. (4) The Inland slopes, populated by the Wa-pi tribe, are little known.

The rocks exposed were provisionally classified. They include pre-Cretaceous schists and gneisses of the main dividing range; pre-Miocene (possibly Mesozoic) altered sediments; Tertiary (probably Miocene) beds of blue micaceous madstone alternating with shale and sandstone, and of limestone; late Tertiary (probably Pliocene) beds of limestone, volcanic rocks, conglomerate, sandstone, and agglomerate; recent and Pleistocene estuarine and river beds, river gravels, sands, and muds. Palæontological notes were supplied by Messrs. Tom Iredale and W. S. Dun. It was suggested that the search for oil be confined in the first place to locating suitable structures in beds of Miocene age which have not been too highly folded or much intruded by igneous rocks. The paper was discussed by Sir Edgeworth David, Mr. J. H. Reid, and Dr. E. O. Marks.

Professor H. C. Richards exhibited a specimen of clay shale with a curious chocolate iron-staining pattern. The specimen, which was forwarded by Mr. T. Blatchford, the Government Geologist of Western Australia, has a very unusual pattern which, owing to its regularity and nature, suggests a possible organic origin. It came from a locality 80 miles south-east of Wyndham, Western Australia, and underlies the Salterella beds. Mr. Blatchford has obtained other specimens of similar pattern in the Braeside area from the Nullagine series. The finder is anxious to have an adequate explanation of the origin of the pattern, and hopes that such may possibly help in fixing the age of the Nullagine beds more accurately.

Professor Richards also exhibited precious opal from a quarry in the Brisbane tuff at Kedron. This was forwarded by Mr. Huxham, an engineer of the Brisbane City Council, and had been obtained during quarrying operations from "porphyry" metal. The exhibits were commented on by Dr. Bryan, and an informal discussion took place.

The Council wishes to draw the attention of members of the Society to an announcement by the Royal Society of New South Wales that a prize, known as "The Walter Burfitt Prize," has been established by that Society. The prize is awarded at intervals of three years to the worker in pure or applied science, resident in Australia or New Zealand, whose papers and other contributions published during the past three years are deemed of the highest scientific merit, account being taken only of investigations described for the first time, and carried out by the author mainly in these Dominions. The prize consists of a medal and the sum of £50, and may be awarded to two authors working in collaboration. The first award will be made in May, 1929, and nominations and publications should be submitted to the Royal Society of New South Wales not later than 28th February, 1929.

Parakilya.

The Minister for Agriculture (Mr. W. Forgan Smith) stated to-day that he had received the following comments from the Government Botanist, Mr. C. T. White, on the recent report in the "Courier" of an interview with the Rev. J. Andrew Barber, Patrol Organiser of the Australian Inland Mission:—

"The plant 'Parakilya' is well known to Queensland pastoralists. It is fairly common in parts of Western Queensland extending through Central Australia to the eastern parts of Western Australia. The actual fodder value has not been ascertained by chemical analysis, though the fact that stock do well on it seems fairly well established; it is not known, however, what other fodder is picked up with the Parakilya. It is one of those succulent plants, characteristic of arid regions, that is able to store water by virtue of a protection of a tough skin or cuticle. Such plants when fed on enable stock to go for a long time without drinking. Although the collection of Parakilya seed presents no great difficulties, it is just a moot point as to how the plant will lend itself to being artificially spread; in its native state it favours sandy soils. However, the experiments to be carried out by the Australian Inland Mission will be followed with great interest by the Department and by pastoralists of Queensland.

"Sir Arnold Theiler, the noted South African Veterinarian, when he was in Queensland recently, spoke of the possibilities of what they know in South Africa as Spekboom. It is like the 'Parakilya' and is a member of the Pigweed Family, but in place of being a small herbaceous plant it grows to a fair-sized shrub. It has been grown to a limited extent in Queensland, but more as a curiosity in gardens than as a possible fodder. In South Africa it has been recorded that this succulent plant along with the Australian Saltbush, makes a valuable mixture for stock; it would seem advisable to make trials with this plant at the same time as the 'Parakilya.' "

The Buffalo Fly.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) views with apprehension the possibility of the extension of the Buffalo Fly into Queensland. This fly, which is a menace to the cattle industry of the States, has been known to exist in the Northern Territory and in the northern portion of Western Australia for some years. The trend of the spread of the fly from the Northern Territory is in an easterly direction, towards the Queensland border, and the extensive movement of stock from that Territory increases the possibility of the introduction of the pest into this State.

In 1925 the Council for Scientific and Industrial Research appointed a veterinary officer to investigate and report on the incidence of the fly in the Northern Territory and Western Australia, and his report indicated its extension towards the border of this State, north of the 18th parallel.

The danger was promptly realised by the Queensland Government, and the possibility of the introduction of the fly into this State was emphasised in a communication addressed to the Prime Minister, in which it was suggested that he should exercise every effort to prevent an extension of the pest.

As 1927 was a drought year in the Northern Territory and North-western Queensland and there were practically no stock movements, special action was not taken to deal with the matter, but during the present year, as the Commonwealth Government did not appear to realise the urgency of protective measures, the Queensland Government detailed a veterinary officer to make a survey of that portion of the Northern Territory contiguous to the Queensland border. In his report, this officer verified previous information available, which was to the effect that the fly had materially extended and had now become a direct menace to the cattle and horses in this State.

Mr. Forgan Smith is strongly of the opinion that a national effort to deal with the pest should be made, and that the Commonwealth Government should take urgent action, not only to combat the pest in the Territory under its administration, but also to prevent an invasion to the Eastern States of the Commonwealth of the fly. The Minister stated that he was prepared to co-operate in a reasonable manner in any efforts which might be made to prevent the introduction of the pest into Queensland, but emphasises the obligation of the Commonwealth Government to treat this matter from a broad, national standpoint in order to afford protection to the cattle industry of the Commonwealth.

Higher Interest on Savings.

An announcement of more than passing interest has been made by the Commonwealth Bank.

From the 1st October, the rate of interest on Commonwealth Savings Bank deposits will be 4 per cent. up to the first £500, the old rate of 3½ per cent. still to be paid on excess of that amount up to £2,000.

As the majority of savings accounts probably have balances of less than £500, the announcement will come as very good news to most Savings Bank depositors, and as a distinct invitation to those people who do not yet use this useful aid to thrift—the savings account.

Another feature of the Commonwealth Savings Bank service is the Purpose Account. Any number of Purpose Accounts may be opened at any branch of the Bank, and the nature of the purpose need not be disclosed. The objective may be provision for holiday expenses, Christmas extras, medical expenses, higher education for the children, or the purchase of expensive articles, such as pianos, cars, wireless sets, &c.

Any sum from 1s. per week or per fortnight may be deposited for a period of not less than three months, and the interest will be added at the end of the period at the rate of 4 per cent. per annum.

The Public Curator Office—a Profit of £4,065.

From the annual report of the Public Curator to the 30th June, 1928, it is ascertained that the year ended with a profit of £4,065, bringing the total profits earned by the office since its inception in 1916 up to £53,863, which sum is credited to the Reserve Fund. As the office functions under the guarantee of the State, this Reserve Fund is available to cover any losses (if any should, unfortunately, be made) before the Government will be called upon to honour its guarantee.

For the first time in the history of the office, the total cash receipts have exceeded the million sterling mark, viz., £1,110,280, and the disbursements amounted to £1,099,004, or a gross turnover of £2,200,000.

The number of Wills and Trusts administered and taken over during the year was 1,778, of the estimated value of £2,009,765, being an increase of £189,480 over the previous year.

The number of Intestate Estates administered and Elections filed was 2,222, of the value of £917,143.

The Unclaimed Money Fund has increased from £121,371 to £140,346, and the amount invested in Government Debentures aggregates £139,500.

In 1916, the first financial year of the Office, the Cash Investments amounted to £97,071, whereas for the year ended 30th June, 1928, they amounted to £870,757.

The progress of the Office is most marked, and is steadily mounting upward year by year. No complaints of any substance have been received, but on the contrary many letters of a highly appreciative nature, concerning the good work of the administration, have come to hand.

The most careful attention has been given to economical management, and notwithstanding the large volume of new business and the distribution of so many estates, there has been only a slight increase in the working expenses of the previous year, and this is accounted for by the statutory increments to the salaries of the staff.

Further evidence of the remarkable confidence shown by the public in the Office is afforded by the constant inflow of Wills completed by living persons appointing the Public Curator executor. On the 30th June last, the total number of Wills made by the Public Curator exceeded 25,000.

The management of such a large number of estates as the Public Curator controls, entails great activity in the investment of money. Up to the present a sum of £657,843 has been invested out of the Common Fund on mortgages and in Government Debentures.

The Public Curator Office is self-contained, accepts responsibility for its own finances, and has always been able to pay its own way and to meet its obligations. While the Office enjoys the guarantee of the State, it has made no call on the Consolidated Fund for any help, and with its strong reserves built up out of its own profits, it is unlikely that it ever will.

The Home and the Garden.

HARMONY OF ASSOCIATION.

By A.K.W.*

The garden glows,
Against its wall the city's heart still beats,
And out from each summer wind that blows,
Carries some sweetness to the tired streets.

Whether your home is built on a small city allotment, or on a large suburban piece of ground, by careful planning and consideration the beauty of both may be enhanced. The house and garden should make a complete picture, and this is achieved by keeping a natural or landscape appearance, with simplicity the main object.

It is always desirable to build a home on the highest elevation, and the main front of the house facing north-east. Where the ground is sloping the possibilities of a garden are boundless. Terraces and steps leading from one level to another make a pleasing feature, especially if the terraces are walled up, and creeping, flowering plants grown in a bed along the top edge of the wall, where the plants will fall over and make an array of colour from the terrace below.

The garden should be laid out in relation to the doors, windows, verandas, and steps of the house. The path leading from the front gate should be so designed that the open door is not visible from the street. By careful planning, a garden may serve many purposes. A distant view may be improved by a foreground of shrubs or flowers; unsightly buildings may be hidden by care in planting.

It may not be possible to lay out the garden when building a home, but it should be planned from the beginning, so that there is no wasted labour in rearranging a garden. A most attractive garden may be made on a small scale on a small piece of ground, and often it is the small garden which produces the greatest number of flowers. During the summer the rich colouring of flowers, the green of grass and trees, and a certain amount of shade will prove a never-ending source of delight to the home-lover, and will add considerably to the value of the dwelling.

All natural features must be considered, and generally the smallest gardens must be the most formal. Where there is a long, narrow path from house to gate, the length of the path is apparently reduced by beds of gay flowers on each side, or its long straight line may be broken by a creeper-covered arch. The lawn of a small home should not be broken up by beds of flowers or shrubs. Shrubs may be planted to hide the boundaries of the ground, and curving paths disappearing behind beds of high-growing flowers tend to make a small garden appear larger.

There is so much outdoor life in sunny Queensland, and so much time may be spent in a garden, that it should be made a restful, beautiful part of a home—a vital part, not merely an adjunct to residence. Most gardeners do not express individuality in their gardens. Very often each garden in a street is laid out in much the same way. Year after year the same annuals are planted in the same beds, as most amateur gardeners do not care to grow plants they know little about.

Garden features, such as seats, summer-houses, pergolas, and sundials should receive more attention. A well-built, substantial garden seat would add considerably to the comfort and beauty of a garden. Such a feature would raise a garden from the common-place, and its beauty would be increased as the seasons pass—gay annuals and roses in the spring, and gold and tawny chrysanthemums and dahlias in the autumn, blooming in the surrounding beds.

Fences may be covered with creepers, which will give an old-world walled appearance to a garden, and form a background for tall growing, old-fashioned flowers, such as hollyhocks. One can imagine such a garden with beds of pinks, heliotrope, petunias, and mignonette. A back gate framed and covered with one of our many beautiful flowering creepers would make a pleasing picture from the roadway and grounds.

The joy of a home with a garden is found in watching its development and growth to a state of perfection, be it just a home surrounded by grass and shrubs, or by a garden full of gorgeous blooms. Sunlight and shade, bright flowers against dark foliage, curving paths and shrubs, quiet corners with garden seats all gain added beauty from each other. Do not let the seasons pass without erecting in your garden some feature from which it will gain individuality and restfulness.

* In the Brisbane "Sunday Mail."



PLATE 146.

This fibrolite bungalow was one of the most interesting exhibits at the recent Brisbane Show, and was a centre of attraction. It embodied many modern features, including rough-cast exterior walls, a variety of artistic interior treatments, and new panel suggestions and wall-paper effects.

VEGETABLES.

Vegetables will require constant attention in the Granite Belt area. Tomatoes and potatoes will require to be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gallons of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain fall. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

Farm Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are

to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

Orchard Notes for December.

THE COASTAL DISTRICTS.

The planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Cannerymen only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every



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berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

INSPIRED BY THE JOURNAL.

A North Arm farmer, renewing his subscription for a further three years, writes (4th September, 1928)—"At the same time I would like to express the joy and inspiration I receive with each number, and trust its circulation is being continually extended amongst those who, like me, can appreciate it."

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

**TIMES OF SUNRISE, SUNSET, AND
MOONRISE.**

AT WARWICK.

MOONRISE.

Date.	November, 1928.		December, 1928.		Nov., 1928.	Dec., 1928.
	R'ses.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.3	6.9	4.50	6.32	p.m. 10.9	p.m. 10.44
2	5.2	6.10	4.50	6.32	11.12	11.30
3	5.1	6.11	4.50	6.33	...	...
4	5.0	6.11	4.50	6.34	a.m. 12.10	a.m. 12.8
5	5.0	6.12	4.50	6.35	1.1	12.41
6	4.59	6.13	4.50	6.35	1.42	1.12
7	4.58	6.13	4.50	6.36	2.17	1.42
8	4.57	6.14	4.50	6.36	2.49	2.12
9	4.57	6.15	4.50	6.37	3.19	2.41
10	4.56	6.15	4.51	6.38	3.48	3.15
11	4.56	6.16	4.51	6.39	4.19	3.48
12	4.55	6.17	4.51	6.40	4.49	4.28
13	4.55	6.18	4.51	6.40	5.21	5.14
14	4.54	6.18	4.52	6.41	5.58	6.3
15	4.54	6.19	4.52	6.41	6.40	6.56
16	4.53	6.20	4.52	6.42	7.27	7.50
17	4.53	6.21	4.52	6.43	8.17	8.46
18	4.53	6.21	4.53	6.43	9.10	9.46
19	4.52	6.22	4.53	6.44	10.6	10.43
20	4.52	6.23	4.54	6.44	11.4	11.49
21	4.51	6.24	4.54	6.45	p.m. 12.3	p.m. 12.40
22	4.51	6.25	4.55	6.46	1.3	1.42
23	4.51	6.26	4.55	6.46	2.4	2.47
24	4.51	6.27	4.56	6.47	3.6	3.55
25	4.51	6.28	4.56	6.47	4.12	5.8
26	4.50	6.29	4.57	6.47	5.20	6.17
27	4.50	6.29	4.57	6.48	6.33	7.24
28	4.50	6.30	4.58	6.48	7.37	8.26
29	4.50	6.31	4.59	6.48	8.54	9.19
30	4.50	6.31	5.0	6.49	9.58	10.2
31	...	...	5.0	6.49	...	10.40

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

5 Nov. ☾ Last Quarter 12 6 a.m.
 12 " ● New Moon 7 35 p.m.
 20 " ☾ First Quarter 11 35 p.m.
 27 " ○ Full Moon 7 5 p.m.

Apogee, 14th November, at 6.6 p.m.

Perigee, 27th November, at 11.30 p.m.

The nearness of Venus to Saturn on the 6th, 7th, and 8th will be interesting to notice between 7 and 8 p.m. a little before they set.

While the Sun is partially eclipsed on the 12th at Madras and many other places in Asia as well as in Europe, including the British Isles, it will be serenely shining here, unaffected by the Moon, which, however, will be remarkably near the line joining the Earth and Sun.

Unfortunately the occultation of Venus by the Moon on the 15th will be unobservable throughout Queensland. Had the time been a few hours earlier it would have been a highly interesting spectacle.

Jupiter will be occulted at Sydney and Melbourne on the afternoon of the 25th, but this interesting sight will be unobservable in Queensland.

On 27th November the Moon will rise completely enshrouded in the shadow of the Earth and therefore entirely cut off from the direct rays of the Sun. From the commencement of totality at 6.33 p.m., for 56 minutes, the Moon will be eclipsed. From 7.39 to 8.39 it will be slowly recovering its usual brightness and will pass through all the phases from new to full in seventy minutes, but will still be in the penumbra or fainter part of the earth's shadow till 9.37; after which it will occult two stars in Taurus, Kappa, and Epsilon. It will be interesting to observers to notice how Kappa will be so close to the southern edge of the Moon as to be occulted for a few minutes only.

The conjunction of Mars with the Moon at 10 p.m. on the 29th will be an interesting sight throughout Australia as Mars will be remarkably near the southern edge of the Moon. In the northern half of China, Mars will be occulted.

The two finest planets, Venus and Jupiter, will be evening stars; Venus in the west, apparently in the constellation Orphiculus from the 1st to the 15th, and after that in Sagittarius. Jupiter will be in the east and apparently moving slowly backwards amongst the Stars of Aries.

Mercury, in Virgo, near Spica, will rise 42 minutes before the Sun on the 1st; on the 15th it will be in Libra and rise 52 minutes before the Sun.

Saturn will be in the western sky, setting nearly an hour before Venus on the 15th.

4 Dec. ☾ Last Quarter 12 31 p.m.
 12 " ● New Moon 3 6 p.m.
 20 " ☾ First Quarter 1 43 p.m.
 27 " ○ Full Moon 5 54 a.m.

Apogee, 11th December, at 7 18 p.m.

Perigee, 26th December, at 12 30 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]



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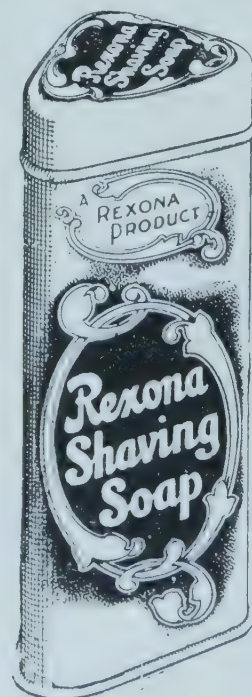
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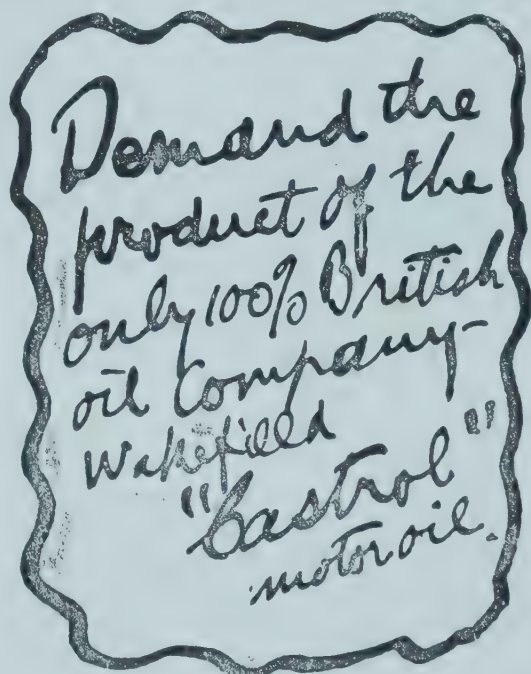
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Marketing Wool to Assist Farmers

The Minister for Agriculture and Stock, in order to assist farmers who carry not exceeding 1,500 sheep upon their holdings, to obtain the best prices for their wool, is prepared to receive such wool on owners' account, classify it, and place it upon the market so that it will not be sold under the star-lot conditions as it has usually been sold.

A correct account of the wool will be kept and each farmer will receive the amount received for same, less the necessary charges, which will consist only of the following:—

1. A charge for classification of 10s. per bale.
2. All freight, handling, dumping, and rebaling.
3. Other out of pocket expenses.

No commission will be charged, and if required an advance of 60 per cent. will be made by the Department of Agriculture and Stock upon the estimated value of the wool as at the time of receipt of the wool in the Department's Store.

The wool will be sold at the first wool sales following a sufficient accumulation to enable a bulk sale to be made.

It must be understood that the limit of this arrangement is 1,500 sheep, and that the Department will not accept a clip from a greater number.

Farmers desiring to accept this arrangement should notify the Under Secretary, Department of Agriculture and Stock, of their intention before consigning their wool, advice of which, with all particulars of brands, weights, &c., should be given.

The weights as taken in the Departmental Store, and the classification before sale, to be accepted as being final.

RECOMMENDATIONS.

(a) The bales should be branded on the cap only, so that the same packs, if in good order, may be used again. This saves the price of a new pack to the farmer.

(b) The wool requires no other treatment on the farm other than the removal of dags before rolling the fleeces.

(c) Locks and belly wool should be kept in separate packages.

E. GRAHAM, Under Secretary,

Department of Agriculture and Stock.

DEPARTMENT OF LABOUR

(CONTROLLED BY THE STATE GOVERNMENT).

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Central Labour Exchanges have been established at Cairns, Townsville, Rockhampton, Bundaberg, Brisbane, Ipswich, and Toowoomba.

Employers who are in need of Labour, and Employees who are looking for work, may have the services of the "Free Exchanges" by using the Letter Cards supplied without charge at all Post Offices, or otherwise communicating their needs to the nearest Exchange.

WOMEN WORKERS.

An Employment Agency for all classes of Women Workers is conducted at The Labour Dept., Edward St., Brisbane. The Agency has for its purpose the better organisation of the Market for Women's Work. Employers are invited to call, write, or wire the Manageress, who will give immediate attention to all applications and inquiries. Women Workers desiring employment of any kind are invited to enrol their names at the Agency.

NO CHARGE IS MADE FOR THE SERVICES OF THE AGENCY.

The Agency deals with all classes of occupations for Women, including Home Work, Educational Work, and Employment in private houses, Offices, Shops, Hotels, Restaurants, Workrooms, and Factories.

F. E. WALSH, Director of Labour.

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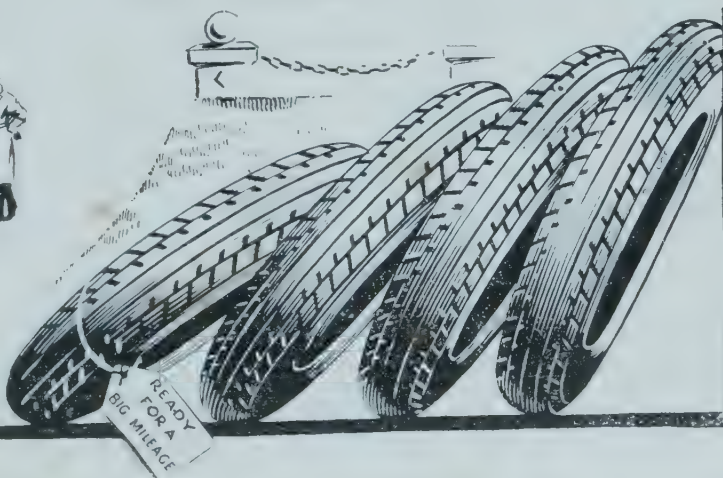
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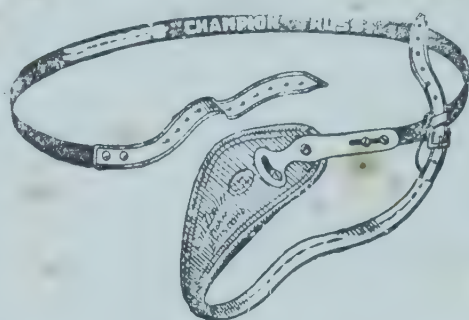
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Part 6



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The Hon. the Secretary for Agriculture

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Edited by J. F. F. REID

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1 DECEMBER, 1928



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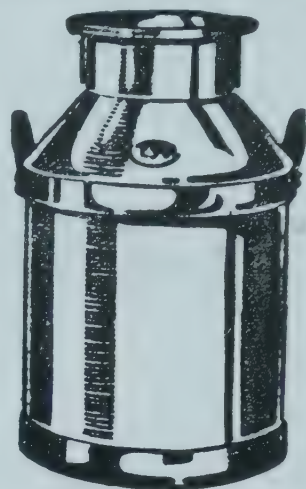
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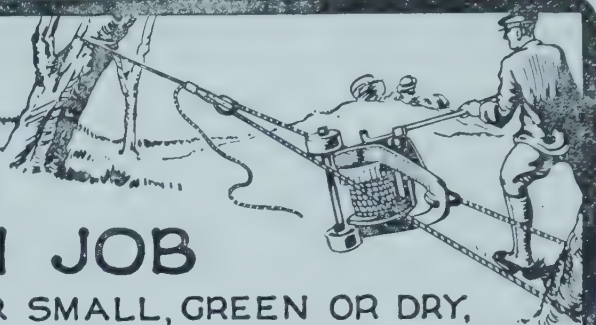
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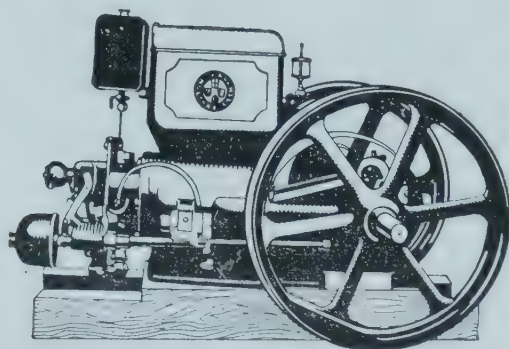
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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXX.

1 DECEMBER, 1928.

PART 6

Event and Comment.

Benefits of Organised Marketing.

IN his report to the Minister for Agriculture (Mr. W. Forgan Smith), the Director of Marketing (Mr. L. R. Macgregor) says that with organised marketing supply can be measurably controlled, demand stimulated, and new markets developed, but complete price stabilisation is difficult of attainment. Economic and climatic influences so operate that even with complete control of a commodity, prices at times must fall, and the primary producer suffers as a result. It appears, however, to be unquestionable that some Queensland agricultural industries would be non-existent but for collective marketing, and all which are subject to control have been materially benefited. There is an increasing support of organised marketing among Queensland primary producers generally. So far there is every indication that the system of collective marketing has become an integral feature of Queensland agriculture.

Objective of Agricultural Organisation.

THE Queensland plan of agricultural organisation dates from the year 1922. In that year comprehensive organisation of farmers was provided for, and the support by the farmers throughout the State of the principle of organisation was enlisted by the establishment of over 700 local producers' associations. The objective was to encourage farmers to co-operate in all matters pertaining to agricultural well-being. The improvement of marketing conditions was adopted as the immediate objective, and in the attainment of which the support of the rank and file of the primary producers was necessary. The objective of organised marketing was adopted, not because that is the only sphere in which farmer organisation can bring benefits to

the farmers, but because it was the sphere in which the advantage of unity of purpose in the attainment of a common object was felt to be most readily demonstrable. Further, it was foreseen to be the objective for which the support of the agriculturists themselves would most readily be forthcoming.

Widespread Character of Controlled Marketing.

AT this time last year thirteen of the main primary products of the State were being marketed under organisation, and that is the position at present. Taking the annual value of the agricultural production of Queensland and reckoning the products which are subject to the system of controlled marketing, it may be said that approximately three-fourths of the annual value of the State's production have been brought under the system.

The Poultry Industry.

THE marketing of eggs is fraught with especial difficulties in excess of those which apply in the case of most primary products. The Egg Board's problems are greater than those of any other commodity board. Following are some points in connection with this matter:—

(1) The product is highly perishable and, although there are peaks and depressions in production, it is nevertheless more or less continuous. In fruit, which is another perishable product, there is a seasonal production, but in the case of eggs there is no period in which the production drops to nil.

(2) For a good many years the production of eggs in Queensland has been in excess of local demand. During the past financial year production has increased by 20 per cent., necessitating an increased utilisation of interstate and overseas markets with resultant costs. As a consequence of such increasing production, the endeavours of the Board and its agents have been severely taxed to hold the market.

The Egg Board is concentrating upon an endeavour to reduce the variation of price that exists as between the period of short supply and of flush production. The Board realises that there would be a greatly increased consumption of eggs on the local market if the price could be prevented from rising to the high figure of 2s. 10d., at which price it is impossible for many consumers to buy. A stabilised price would level up consumption on the local market to higher figures all the year round. The Board is seeking to restrict variations in price, but the increasing production of eggs is proving a serious handicap.

Canary Seed.

THE market conditions for canary seed this season have been singularly unfortunate. Shortly after the inception of the Canary Seed Board there was a fall in world values to £16 10s. per ton for Argentine seed on 15th March. Imported canary seed was offered at that figure by importers at a uniform price at all Australian ports. The Board was forced into the position of having to consider meeting the competition of the imported article, or, in the alternative, of holding seed indefinitely for higher values. Merchants had the opportunity through the importers of booking up imported seed at the low values ruling in the month of March for spread delivery during the ensuing months. If, therefore, the Board had not met this competition its market would have been cut off for months ahead owing to the bookings by merchants of imported seed. The holding of the seed would have necessitated the Board incurring storage and interest charges for at least a year, with no certainty then that the market would have improved by that time. It was therefore decided to sell canary seed competitively with the imported article. The only advantages, therefore, which the producers have had through the Canary Seed Pool this season are—

- (a) The full advantage of the protective duty of £8 8s. per ton.
- (b) The advantage of the cleaning and treatment of the seed at rates cheaper than would have been available to the individual.
- (c) The price has been held at import parity, notwithstanding considerable importations; whereas in the absence of a pool, if merchants had been fully booked up with the imported article, the probability is that the local production (without control of the market) would have fallen to less than import values.

The Peanut Industry.

THIS industry continues to develop. Up to the present time, pending treatment and sale, the nuts have been stored at farmers' barns and various other unsuitable locations, and, as a consequence, consideration has been given to the erection of a modern storage and treatment plant. This plant is now in course of construction, and it is estimated that it will be completed in the beginning of 1929, and that it will be available for next season's crop. The plant will enable the more economical handling of the product. It will also make safe storage available, and improve the grade of the product placed on the market.

Production Problems in the Dairying Industry.

WITH the apparent return of more favourable climatic conditions, a focussing by the dairying executives of the attention of their constituents to production problems is urgently desirable. It is not yet fully appreciated by dairymen that an increase in the production per cow is capable of exerting more direct influence in increasing their monetary return from the product than is readily attainable by an artificial raising of price, so long as export exceeds local consumption. This is more noteworthy as regards Queensland than in the case of any other Australian State. Even if the objective of an all-Australian price is attained, dairymen, in a State such as Queensland which exports annually about two-thirds of its production, will always be handicapped in comparison with dairymen in a State like New South Wales which consumes most of its own production.

The objective of increased production per cow may be gradually attained by the application to production problems of the same enterprise and vigorous organisation methods as have been manifested by Queensland producer leaders in co-operative manufacture and marketing, and in particular by the application of these methods to—

- (1) The undertaking by L.P.A.'s in dairying districts of herd testing.
- (2) Rigorous culling of unproductive cows.
- (3) The use by producers of the facilities which exist whereby dairymen may secure bulls of high producing strains, including the Departmental Better Bull Scheme.

It is admitted that bad seasons are discouraging to dairymen taking active steps in the directions indicated, but the return of good seasons renders it timely for L.P.A.'s in dairying districts to encourage their members along these lines.

Deciduous Fruit.

THE position of the deciduous fruit industry as engaged in largely in the Stanthorpe district has been carefully reviewed during the past year. Some points in connection with the matter are:—

(1) The total number of packages sent from Stanthorpe to Brisbane for the 1928 season was 649,838, as against 450,837 for the year 1927, the average number of packages per Stanthorpe grower being 1,000 for approximately 700 growers.

(2) There has been considerable development in the despatch of quantities direct from Stanthorpe to the provincial centres.

(3) Deciduous fruits for factory purposes were formerly purchased haphazardly, some being despatched direct from grower's station to factory, but a considerable quantity was purchased from the market. Second-grade fruit is suitable for manufacturers' requirements, and a freeing of the fresh fruit market of the second-grade fruit in question automatically improves the market for the better quality fruits.

(4) The quantity sent direct to factory in previous years was a fraction only of 1 per cent. Last year the quantity sent direct to the factory was 6 per cent. of the total, the figures being—

							Tons.
Direct to fresh fruit market	..	..	..	..	..	..	10,969
Direct to factory	..	..	..	..	..	..	698
Total	..	..	..	..	..	..	11,667

Thus it seems possible to increase the proportion sent direct to the factory to probably 10 per cent. It is important to note that the fruit sent direct to factory is the second grade, which exercises the greatest depressing effect on the market. Further, a surplus of 10 per cent. will frequently depress the market out of all proportion. The market, therefore, is being relieved to a greater extent than the percentage actually

Bureau of Sugar Experiment Stations.

BIOLOGICAL CONTROL OF CATERPILLARS ATTACKING SUGAR CANE.

Mr. E. Jarvis, Entomologist at Meringa, near Cairns, has submitted the following report for the period, October to November, 1928, to the Director of the Bureau of Sugar Experiment Stations:—

Amongst the numerous natural enemies belonging to class Insecta, which wage perpetual warfare against the caterpillars of various species of the order Lepidoptera, a few of the so-called "ground beetles" (Carabidæ) occurring commonly in our canefields happen to be of decided economic interest.

About a couple of months ago (15th September) the present writer confined a specimen of *Rhytisternus carpentarius* S. in a small breeding-cage, in order to make a preliminary study of its range of dietary whilst under confinement. This carab measures about 18 mm. in length (nearly three-quarters of an inch), and in general appearance is lustrous black, with exception of the antennæ and tarsi which are dark reddish, the latter being provided with stiff hairs. The upper surface of the body is flattened, the elytra having about twelve decided dorsal striae, and about three striations on the sides of each elytron.

At intervals of from four to seven days the following miscellaneous insects were killed by and greedily devoured by this predaceous beetle—viz., two large sarcophagid flies; a caterpillar of *Cirphis unipuncta* Haw. ("Army Worm"), about 1½ inches long; a grub of *Isodon puncticollis* MacL. in the third instar; a pupa of *Dichocrocis punctiferalis*, "Peach Borer"; two cockroaches, *Periplaneta americana*, and a smaller arboreal species; and a caterpillar of *Laphygma exempta* Walk.

Each of these insects was put into the cage during the afternoon, at which time the beetle was hidden in the soil under a stone, and was usually found to have disappeared by the next morning. The harder chitinous portions, such as the head and mandibles of larvæ and wings and elytra of the dipterous and orthopterous insects respectively, were invariably rejected.

Perhaps our most useful species of "ground beetle" will prove to be *Chlœnius australis* Dej., some of the predatory habits of which were recorded by the writer for the first time in the year 1921 ("Queensland Agricultural Journal," vol. xvi., p. 278). Both the adult and larval forms of this insect were observed destroying caterpillars of the "grass worm" *Laphygma exempta* Walk., which during February of 1920 inflicted great damage to the leaves of young cane and maize plants at Meringa, near Cairns.

These predaceous larvæ occurred quite commonly in this affected area, attacking principally the caterpillars traversing the bare ground between cane rows, but also exploring the leaves in search of prey. Upon encountering a caterpillar the predator instantly buried its powerful cutting mandibles deeply in the body, near the head, and then simply hung on, while the unfortunate victim vainly endeavouring to shake off its foe, twisted and rapidly rolled over and over convulsively. Such struggles seldom lasted more than a minute, at the end of which time even large caterpillars seemed too weak to offer further resistance, and suffered the enemy to greedily imbibe their life juices until its body had become greatly swollen and could hold no more.

The larvæ of *C. australis* run with agility, being exceedingly active and pugnacious. When alarmed, they hide in small holes or sun-cracks in the dry earth. Specimens captured in the field and fed upon noctuid larvæ and pupæ pupated at the bottom of breeding-cages under damp soil. The pupal condition during March (one of our hottest months) lasted only seven days; the mean shade maximum temperature at the time being about 87 deg. Fahr.

Scientific descriptions of the larval and pupal stages of this beetle need not be given here, but I may state that in general appearance the larva is uniformly black, of typical campodeoid form, and slightly exceeds half an inch in length. This beetle is about 15 mm. long, with pronotum and head shining green and deeply punctulate; wing-cases dark brown, edged with green, and often suffused with iridescent pink; each elytron with eight parallel rows of punctures. Legs and ventral surface of body shining black; palpi and basal joints of antennæ reddish-brown.

In a paper dealing with the "Economic Value of Certain Queensland Parasitic Insects," contributed to the Pan-Pacific Congress held in Sydney during August, 1923 ("Queensland Agricultural Journal," vol. xxii., p. 115), the present writer advocated the introduction of this useful predator into other countries desirous of enlisting its services in connection with biological control work.

It is of interest to note that during 1919 a species of *Chlænium* (probably *C. australis* Dej.) was introduced into Hawaii from North Queensland by the Sugar Planters' Association; presumably for the purpose of combating army worms. Several species of this useful genus of Carabidæ perform valuable services in other parts of the world against various lepidopterous insect pests. *Chlænium tomentosus* Say., for example, helps to control the ravages of the so-called "Tobacco wire worm" (*Crambus caliginocellus* Clem.) in Virginia, and is believed also to be predaceous on the grubs of *Lachnosterna* in North America; while *Chlænium dichrous* destroys caterpillars of the familiar "Codling Moth" (*Cydia pomonella*) in South Africa.

In addition to *C. australis*, alluded to above, two other species of this genus are not uncommon here in canefields, viz., *C. flaviguttatus* MacL. and *C. ophonoides* Fairm., both of which should be protected by the grower when noticed in plough furrows.

Enigma cyaneum Cast. is another of our farmers' friends, and may be easily distinguished from the foregoing species by its lovely bright blue wing-cases. The metamorphosis of this beetle is being studied at present at Meringa Experiment Station.

Emergence of Greyback Cockchafers.

The month of October was a very dry one, our registration at Meringa Experiment Station being eleven points, instead of 1.84 inches, which is the average rainfall for the Cairns district for this month during the last forty-five years. November, however, saw a change in the weather, and up to date (14th November) we have recorded 8.93 inches at Meringa. This welcome rain was accompanied by much cooler conditions, the mean shade maximum temperature during the period 11th to 14th November being 81.75 deg. Fahr., while our average for the entire preceding month (October) was 91.6 Fahr. It is interesting to note that the latter temperature was unusually high for October, seeing that our average for this month during the last five years happens to be 87.92 deg. Fahr.

A few odd specimens of greyback cane beetles have already appeared on the wing, the earliest capture recorded being on 4th November. Up to the present, however, the main body is still below the ground, but may be expected to emerge directly weather conditions favour commencement of the flying period.

RELATIONSHIP BETWEEN INSECT ATTACK AND PLANT FAILURE

The Southern Assistant Entomologist, Mr. R. W. Mungomery, has submitted the following report for the period October to November, 1928, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Generally speaking, cane which has been planted in spring is, to a greater extent, more subject to the attacks of insect pests than autumn-planted cane. This condition is applicable to the Southern part of Queensland, where these two distinct planting seasons are chiefly recognised. This state of affairs is not to be wondered at when it is remembered that spring represents the time when practically the whole insect world is waking from a period of dormancy, and when new insects are hatching out and entering on a period of activity, all intent on feeding and a consequent destruction of our crops. In the autumn months most of the insects are preparing for their dormant winter period, or at least a period of decreasing activity; accordingly insect damage from then onwards throughout the winter is on the wane.

The most important insects known to attack cane sets are the various species of cane grubs (*Scarabæidæ*), wireworms (*Elateridæ*), mole-crickets (*Gryllotalpa* sp.), plant-eating beetles (*Rhyparida* sp.), soldier fly larvæ (*Stratiomyidæ*), and others, each of which is known to do serious damage in certain areas. With this long region of foes arrayed against the grower at planting time, it would seem that his chances of obtaining a successful strike are somewhat meagre. Happily for him, some of these are so restricted in their choice of certain types of soils, moisture conditions, &c., and exhibit such partiality for certain plants which serve them as food, that seldom do more than one of these major pests occur in any one field

at the same time. Further, by taking pains in the preparation of his land previous to planting, and by cleaning up all waste and neglected areas, which form what one might almost term sanctuaries where pests may breed unmolested, he is ridding his farm of possible sources whence an insect attack may originate, and in so doing he is greatly increasing his chances of obtaining a regular stand of cane in his plant crop.

Notwithstanding, as previously pointed out, the number of pests that may beset the farmer at planting time, the writer is of the opinion that in many cases insect damage to newly planted sets is greatly exaggerated, and in the majority of cases so quoted, failure to secure a good strike is due chiefly to the lack of attention paid to the details of plant selection and to the actual cutting of the plants themselves. A case in point occurred quite recently when we were called on to investigate the failure of a certain field of cane, which the farmer wrongly attributed to insect attack. When this matter was investigated, it was found that the plants he had been using were from 2 to 4 inches in length showing one to two eyes only, which practice shows a lack of knowledge of the general principles of sugar-cane growing. The practice of planting three-eyed plants is now almost universally favoured, and plants should not be cut less than about 9 inches in length, despite the fact that more than three eyes may be included in this length of cane. In exceptional cases of canes with long internodes, two-eye plants may have to be used to enable the plant to pass through the planter chute, but such instances are comparatively rare. Obviously, in the case under consideration three-eyed plants should have been used, and if this had been done a high percentage strike would have been assured, for the forest land on which this failure happened, was, at the time of our investigations, carrying a fair moisture content. Small sets may strike and grow well in wet situations, but as soon as drought conditions prevail for any length of time the resulting plants are the first to wilt and die. Then, some insects such as our common brown ant (*Pheidole proxima* Mayr.) may take up their abode in these old dried-out cane sets, and are frequently credited with being the primary factors in the death of that set, whereas their presence there is chiefly secondary.

Again, the peculiar tendency which certain varieties have when grown under cold and wet conditions, of "bleeding" when cut early in the season, and later, failing to ratoon, has frequently earned evil reputations for many insects which happen to be present in that particular field. Such reputations are no doubt undeserved since they may or may not in any way be associated with sugar-cane as a source of food supply.

Fortunately, the cases cited above are not frequent, but are typical of a few that are met with from time to time. Information on subjects which involve such questions as cane cultivation can be readily obtained from the Field Assistant who pays periodical visits to the various sugar-growing centres.

GREEN MANURES FOR CANE CROPS.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

THE practice of growing green crops, especially leguminous plants, is one that can be strongly advocated in cane cultivation. Cane-growers frequently ask for information as to the best seed to use, and the quantity per acre, and it is thought that a short article would be of assistance to growers.

Shortly summarised, green manures increase the warmth and better the texture of the soil, and such crops are generally looked upon as increasing the humus content. Other advantages are—

- (1) During growth the ground is shaded and moisture is conserved.
- (2) Erosion of fine earth is prevented during heavy rains.
- (3) Weed killing is promoted.
- (4) The deep tap roots of leguminous plants bring available plant food from the subsoil to the surface soil.
- (5) The interposition of a crop other than cane acts in minimising diseases and insect attacks.
- (6) Any form of crop rotation is an excellent one to practice.

Nitrogen is the soil element that becomes the most quickly exhausted, and is also the element that is the most expensive to purchase. Under favourable conditions the nodules upon the roots of leguminous crops contain countless thousands of

bacteria which seize the nitrogen from the air. It is possible to add from 100 to 200 lb. of nitrogen per acre.

The best forms of green manure to use for cane are cowpeas and Mauritius bean. These can generally be procured at any large seedsman's, but the price varies from year to year according to the supply. If there were a regular demand for green manure there is no doubt that farmers in the Southern part of the State would cater for the supply, but the demand is not nearly so great as it should be, and consequently farmers who grow this crop for seed are few and far between.

Green manure seed is generally sown broadcast at the rate of one bushel per acre. If it is drilled in, 20 lb. per acre are usually sufficient when the drills are spaced 18 inches to 2 feet apart. In Northern sugar areas it is generally sown broadcast, while in the South it is generally drilled. The best time to sow green manure seed is from October to the end of December—November is probably the best month. In sowing broadcast it is generally sufficient to harrow the seed in, but in any case the seed should not be planted more than an inch to a inch and a-half. It is a wise practice to sow after rain.

Cowpea usually flowers in from two to three months if conditions have been favourable, but Mauritius bean takes as long as five months, but usually makes a heavier crop. The best time to plough in green crops is at the time the seed in the pods is in a milky condition. Some difficulty may be experienced in ploughing in a heavy crop of green manure, but by first rolling, then disc harrowing, and finally using the plough with a large disc, it becomes an easy matter to cover the crop. Generally speaking, it takes from six to eight weeks for the crop to rot down. If this has taken place and the time is convenient, the ground can be got ready for the succeeding cane crop.

The following are analyses made of cowpea and Mauritius bean:—

Variety.	Pounds per Acre.			
	Nitrogen.	Phosphoric Acid.	Lime.	Potash.
Cowpea	151	35	..	96
Mauritius Bean	173	40	317	141

CANE GRUB ACTIVITY.

The Southern Assistant Entomologist (Mr. R. W. Mungomery) has furnished the following report for the period 15th September to 15th October, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

October is the month when grub damage in the South is likely to become very noticeable, and growers should keep a sharp watch for the first signs of their activities. The dry weather conditions which are now prevailing will help to reveal their presence, for it is well known that grubs have a greater effect on a cane stool during a dry period than during a wet period. Cane stools at which grubs are feeding are characterised by the outer leaves of individual sticks assuming a sickly yellowish appearance, while the central spindles, though green, show a decided wilt, which is unnatural with healthy growing cane. Bandicoot burrows around a stool of cane often furnish additional proof of grubs being present.

When the grower has satisfied himself that grubs are present, fumigation should be resorted to as soon as possible, and provided that the rooting system of the stool is not too badly damaged there is every reason to hope that it will recover sufficiently to produce a fair crop, but it is almost futile to wait until the young leaves are quite dry and the plant almost dead before fumigating, and then to expect a crop.

If grub damage shows up in the spring months, paradichlorobenzene can be used with good results. Care should be taken that this fumigant is not injected too deeply into the ground, otherwise it will not evaporate sufficiently to produce a high mortality, and 2-3 inches will prove a sufficient depth in the Bundaberg and Isis districts at which to bury these crystals. Paradichlor. has the property of giving

off toxic vapours for a considerable time, and this is a distinct advantage when we take into consideration the habits of our injurious scarabæid grubs. The majority of these grubs remain in the second stage throughout the winter months and assume their third stage in the spring. Soon after this last moult they usually rise towards the surface and recommence feeding at the cane roots. Now, as there is a marked overlapping of the second and third stages, it will be apparent that there may be differences as great as a month or more in the times at which different grubs resume feeding, hence paradichlor. is particularly suited to be used as a fumigant in such cases, for when each successive grub comes to feed at the stool and likewise comes within the effective radius, it is either killed or the fumigant may act as a repellent and drive it away.

Carbon Bisulphide as a Fumigant.

Carbon bisulphide, when injected in the soil, though quicker acting than paradichlor., and killing the grubs in a much shorter period, does not possess the property of remaining toxic over a number of days, and therefore would fail to kill those grubs which rise towards the surface subsequent to the act of fumigation. Later on in the year, towards December, when in the ordinary course of events thunderstorms have occurred from time to time and the soil is in a fairly moist condition, grubs for the most part will be found feeding near the surface (say within the first 8 inches of soil) and then the use of carbon bisulphide is to be recommended in preference to paradichlor. Used in sandy loam forest soil against third-stage "trichosterma" grubs last December, a mortality of almost 100 per cent. was obtained.

With paradichlor. injected at the same time, the difference was very apparent. Soon after applying the fumigants heavy rains were experienced and in a month's time no mortality had taken place amongst those grubs which were subjected to this latter fumigation, and the cane had suffered quite as much damage as that in the untreated rows. Later, however, after an interval of fine hot weather, the treated rows began to look very much greener, and healthy suckers came away from the stools. This plot then stood out in sharp contrast to the untreated rows which had been almost entirely killed. On closer investigation it was seen that the majority of the grubs had stopped feeding and were in a semi-paralysed condition. Succeeding rains accompanied by a reduction in temperature soon prevented further evaporation of the paradichlor. crystals, enabling the grubs to recover. They have since been watched with considerable interest, and recent diggings revealed the fact that they had pupated successfully. On account of this and similar past experience, the use of paradichlor. against large third-stage grubs is not advocated when the monsoonal season is imminent, carbon bisulphide being cheaper, easier to apply, and giving a higher mortality.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Weather.

Very dry conditions have been experienced during the last twelve months, dating from August, 1927, to July, 1928; the rainfall for which period has been 49.20 inches, or 42.24 inches less than the average annual precipitation for the district of Cairns; while the fall during June to October of last year (1927) happened to be 163 points less than the average for these five months of the year.

Don't Forget the Date on which Greybacks Appear on the Wing.

Growers would do well to make a note of the date on which these beetles are first noticed in canefields. Emergence of cockchafer from the ground usually takes place about twenty-four hours after a fall of from 3 to 4 inches of rain; such swarming serving to indicate that about six to eight weeks later is the best time for carrying out fumigation of grub-infested soil—viz., at a time when these larvæ, being in the first and second stages of growth, are not large enough to cause appreciable injury to the cane roots.

Capturing Greyback Cockchafers.

Preparations should now be made for collecting cane beetles on plantations where feeding-trees of *albohirtum* happen to be conveniently situated, and can be used as trap-trees.

The broad-leaved figs such as *Ficus pilosa* and *glomerata*, or the "Weeping fig," *F. benjamini*, are great favourites, and generally attract most of the beetles in the vicinity of a canefield. Where found growing close to headlands it would be a good plan on certain cane areas to cut out surrounding vegetation to within a radius of a couple of chains in order to induce beetles to concentrate upon them, and to facilitate collecting from same. During the first week from 20 to 30 per cent. of greybacks taken in this way will be females, but by the end of the second week after date of emergence the sexes are generally met with in about equal proportions, while during the third and fifth weeks after first appearance of the beetles about 75 per cent. of those collected will probably be females.

Remember that Both Sexes of the Greyback Cockchafer are Strongly Attracted by Artificial Lights.

It is necessary to again remind readers that the so-called "Southern Cane Beetle," *Pseudoholophylla furfuracea* Burm., is a totally different insect from the Greyback of Northern canefields. Mr. R. W. Mungomery, Assistant Entomologist, discovered that only about 1 per cent. of females of *furfuracea* are attracted by artificial lights; whereas, it has been conclusively demonstrated during the last fourteen years that both sexes of the greyback cockchafer are strongly attracted to acetylene and other artificial lights throughout their aerial existence. The proportions of female beetles captured in light-traps a few days after emergence from the ground varied from 20 to 25 per cent.; but about three weeks after emergence (early in January) catches during two consecutive evenings yielded 47 to 75 per cent. of the female beetles.

Emergence of Cane Beetles.

Greyback cockchafers commenced to appear on the wing around Gordonvale, Meringa, and Highleigh about the 6th November, when a few odd specimens were seen flying to artificial lights. The earliest emergence noticed by the writer at the Experiment Station was a female greyback which, on 4th November, was attracted from a weeping fig (*Ficus benjamini*) growing against a veranda. No decided fighting, however, took place until 15th November, so that by the time these notes are published this cane-beetle will have started to lay its eggs.

When to Fumigate.

The time to commence treatment of the first- and second-stage grubs of *albohirtum* (greyback cockchafer) will date from about the third week in December, and continue until the end of January, as long as ground to be fumigated remains free from excessive moisture and the land continues unshaded during midday between the stools of cane.

The Farmers' Friends.

Do not destroy soil-frequenting larvæ which are predaceous or parasitic on cane-grubs.

Some of the commonest of these can be recognised by the following brief descriptions:—

1. White maggot-shaped sluggish larvæ about an inch long, which when ploughed up are often found attached to or alongside dead or paralysed cane-grubs.

2. Dark-brown elongate-oval cocoons from $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, composed of silk hardened to the stiffness of writing paper. Those are sometimes exposed by the plough, and contain either male or female digger-wasp parasites.

3. Shining white maggots about $1\frac{1}{2}$ inches in length, but more slender than those of No. 1, and able to move quickly through the soil by means of a pointed beak. These predaceous larvæ of "Robber Flies" pierce and suck the life juices from various cane-grubs.

4. Large flattened wire-worms, from one to two or more inches long, having yellowish-brown shining bodies with six small legs close to the head-end. These slippery, very active creatures are inveterate enemies of cane-grubs, seizing them with their sharp sickle-shaped jaws, cutting deeply into the body, and greedily imbibing the succulent contents.

What Causes "Dead-Hearts."

Growers should have a look occasionally at the condition of their young plant and ratoon cane, at a time when the shoots are from 9 to 18 inches high. Wilting or browning of the heart-leaves is usually due to the presence of some caterpillar

tunnelling in the centre of the stem. Although the "Large Moth-borer" is mainly responsible for such trouble, the larvæ of two smaller moth-borers and of a plant-eating beetle are also able to cause similar injury to the central leaves. All shoots affected by "dead-hearts" should be cut out, taking care to sever them at a point situated about 2 inches below ground level. These shoots should then be crushed or burnt to destroy any pupæ or caterpillars remaining in the tunnels. Infestations of less than about 10 per cent. do not as a rule necessitate control measures.

POSITION IN THE NORTHERN DISTRICTS.

The Entomologist at Meringa (Mr. E. Jarvis) has submitted to the Director, Mr. H. T. Easterby, the following reports on the Innisfail and Ingham districts by Messrs. J. H. Buzacott and W. A. McDougall:—

INNISFAIL.

This year the Innisfail Show comprised the finest collection of exhibits and events ever yet provided there. In combination with the South Johnstone Experiment Station and the Pathological Branch, a display from Meringa was presented, consisting of various insect pests of sugar-cane and their biological enemies, together with charts and wall cases depicting their life-histories.

The opportunity was taken to talk with the many farmers interested in the exhibit, and to endeavour to advise them, where possible, how to deal with some of the more important pests.

Grubs have been very bad this season throughout the district, though several farmers in the Goondi area fumigated their crop earlier in the season. Mr. MacLean, Field Officer at the Goondi mill, intends carrying out experiments on trapping beetles by light during beetle-flight. He also directed fumigation experiments on a few farms in the early part of the year.

Considering the late month of the year in which the show was held, the competitive cane exhibits were remarkably good, especially taking into account the fact that considerably more than half the cane in the district should be cut by now.

On farms served by the Goondi mill, a favourite green manure is the Rice Bean. This is a good cropper, and comparatively easy to plough in, and, although very subject to the attacks of insect pests, seems to do very well in that district. The Rice Bean is, undoubtedly, of high manurial value.

INGHAM.

From the 1st to 5th October was spent in the Victoria and Macknade mill areas. The district was dry and very dusty.

The Beetle Borer (*Rhabdocnemis obscurus* Boisd).

Throughout the mill areas the damage by this pest is less than 2 per cent. For the past two years tachinid flies (*Ceromasia sphenophori* Vill.) have not been liberated in these areas. During the five years previous to this, when the borer was a serious pest, 6,127 flies were distributed by officers of the Macknade mill; also several liberations were made by this Station. In the event of borer damage again becoming an economic problem in these areas, the facilities for its scientific control are in readiness at the Macknade mill. The fly cages have not been dismantled, and field officers are in touch with all farms throughout the districts.

The Pest Destruction Fund.

The mill areas are divided into ten districts (five in each area). The farmers in each district voluntarily strike levies, payable to a farmer secretary, for the destruction of the various cane pests, chief of which are rats and cane beetles (grubs and adults). This fund is independent of the mill managements, and is in the hands of the farmers themselves. According to the district the levy is struck on area under cane or on tonnage cut.

Grub Damage.

The greyback (*Lepidoderma albobirtum* Waterh.) has been responsible for considerably more than 90 per cent. of the grub damage in these areas. The last attack was very mild, only showing up on a few farms in the Hawkins Creek, Cordelia, and Stone River districts. The affected fields were cut early. In the

Macknade district, £177 1s. was paid in 1924-5 for grubs and beetles collected; in 1925-6 £127 9s. 7d.; and in 1928 £1 4s. 6d. In both mill areas, at present, the grub damage is negligible.

Damage by Rats.

It is to combat the rat trouble that most of the money of the various pest destruction funds is spent. The Macknade district pest destruction fund paid in 1926 £4 for poison; in 1928 £30 4s. 6d. for poison, and for labour for dropping baits £108 (approximately). At 6d. a rat, from 2nd July, 1928, £72 has been paid to collectors. The remaining districts are in a similar position with regard to rat damage, and, with the exception of one district which pays 3d. a rat, offer 6d. a rat to collectors.

Various poisons have been tried—viz., phosphorus and bread, strychnine and corn, arsenic baits, and the barium biscuit. At present the subject of rat poisons is in its experimental stage. The barium biscuit, for many reasons, would be the most suitable, but some farmers doubt its worth as an effective rat destroyer. It is thought that for rats the poison should be changed periodically.

Green Manures.

Last year 900 acres of green manure (chiefly Mauritius bean) were grown in Victoria mill area. In Macknade mill area 500 to 600 acres were planted last year, and approximately 1,000 acres (chiefly the two cowpeas and Mauritius bean) this year.

The Burning and Turning in of Trash.

If the field is to be ratooned the trash is burnt, but, before planting, more than 50 per cent. of farmers turn in the trash. As there is no borer problem to contend with, the mill authorities strongly recommend turning in of trash before planting. This practice is becoming more prevalent every year. By various analyses it has been proved that the turned-in trash is equal to one-to-two lots of green manure.

Cane Varieties Grown, and Gumming.

The following table gives the relative percentages of the different varieties planted in 1926 and 1927:—

Variety.	Macknade Mill Area.		Victoria Mill Area.	
	1926.	1927.	1926.	1927.
	Per cent.	Per cent.	Per cent.	Per cent.
Badila ..	22.0	24.2	32.4	31.8
H. 409 ..	35.9	24.0	20.3	22.0
N.G. 24, N.G. 24A, N.G. 24B ..	5.6	3.9	9.6	7.1
Korpi ..	15.1	17.1	9.9	11.2
Nanemo ..	3.5	3.9	3.1	2.3
Orambo ..	5.3	12.1	8.1	8.6
Q. 813 ..	9.8	13.7	15.2	14.6
Innis ..	0.8	0.8	1.1	1.2
M. 1900 Seedling ..	..	..	..	0.1
H.Q. 426 ..	..	..	..	0.2
7 R. 428 (Pompey) ..	0.3	..	0.1	..
Mixed (including D. 1135) ..	1.7	0.3	0.2	0.9

Before planting any varieties other than the first ten in above table, permits must be obtained from the mills. Mill officers see that clean plants are used for all planting throughout both mill areas. In 1926, 35.9 per cent. of the plant was H. 409. This dropped to 24.0 in 1927. At that time it was thought that this variety was too susceptible to gumming. Now, however, H. 409 is more extensively planted, as it was found that it is not so susceptible as it was first supposed to be.

H.Q. 426 is condemned on account of its extreme susceptibility to gumming, and the 0.2 per cent. planted in the Victoria area is for experimental purposes. It is under strict supervision.

Thanks are due to the chief field officer at the Macknade mill and the secretary of the Herbert River Farmers' League for information supplied.

BIOLOGICAL CONTROL OF CANE INSECTS.

Mr. E. Jarvis, Entomologist at Meringa, has submitted the following report for the period of September to October, 1928, to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby):—

Vegetable Parasite of Cane Borer.

About four months ago some test tubes containing cultures of a vegetable parasite known to attack a beetle borer (*Rhabdocnemis* sp.) found to affect sugar-cane in the Philippines were brought to this Experiment Station, instructions having been previously received from the director regarding the advisability of our studying its possibilities as a controlling factor against *Rhabdocnemis obscurus* Boisd. under North Queensland climatic conditions.

These cultures, which were prepared by Mr. A. F. Bell, Pathologist to the Sugar Bureau, in September, 1927, were grown on corn meal agar. During June of 1928 this fungus was successfully propagated on sterile slices of potato, and by the fifth day Mr. J. H. Buzacott, Assistant to Entomologist, who had been given charge of this work, noticed a growth of hyphæ, on which fructification appeared on the ninth day after inoculation; the average shade temperature during this period being about 66 degrees Fahr. Of the various methods of infection tried, that of spreading the spores on a piece of cane sectioned longitudinally and placing same with caged beetles was the only one that gave positive results. Other methods used were—

- (2) Inoculating the beetles by a platinum wire;
- (3) Placing them in a culture tube to crawl amongst the spores; and
- (4) Sprinkling the beetles with water containing spores of the fungus.

Additional experiments carried out in September, 1928, demonstrated that this vegetable parasite will grow luxuriantly on sterilised rice; spores of the fungus being produced on this simple medium on the fifth day after inoculation.

Breeding and Distributing Parasites of the Weevil Borer.

The increase of *Rhabdocnemis obscurus* Boisd. having been favoured, as was expected, by conditions brought about by the last cyclone, special attention has been bestowed on the breeding of *Ceromasia sphenophori*, with the result that during the last few months (April to August, 1928) 1,127 living specimens of this tachinid fly were reared at Meringa Experiment Station and released on thirty-one different selections among borer-infested cane. In addition to these consignments, field boxes were established at Mourilyan and Mount Sophia, holding cane sticks containing in all about 150 puparia of *C. sphenophori*.

Liberations of live tachinids were made on mill areas of the following districts:—South Johnstone, 463 specimens; Goondi, 295; Babinda, 232; Mulgrave, 107; Mourilyan, 30.

The work of breeding and liberating consignments of this useful parasite has been given to Mr. W. A. McDougall, Assistant to Entomologist, who has shown much interest in this branch of biological control.

Entomological Exhibit at Innisfail.

Our Experiment Station was represented this year at the meeting of the Johnstone River Agricultural Society, held at Innisfail on the 5th and 6th October.

Despite industrial trouble on the waterfront, which prevented many growers from attending, the show at Innisfail this year was considered to be the best ever held in the district. The Station exhibit, under the charge of Mr. J. H. Buzacott, comprised showcases containing examples of North Queensland cane insects, amongst which were included the various life-cycle stages and insect enemies of primary cane pests such as *Lepidoderma albohirtum* Waterh. (greyback cockchafer); and the weevil borer of cane, *Rhabdocnemis obscurus* Boisd.

Other attractions were large diagrammatic coloured charts illustrating insect life, and a number of store-boxes holding pinned specimens of many insects of decided economic importance.

Several growers availed themselves of the invitation to freely discuss matters relating to the control, &c., of insects which chanced to be troubling them, or to seek information regarding cane beetles and their grubs.

Review of Past Field Tests with the Grub Fumigant—Paradichlorobenzene.

Between the dates 17th January, 1923, and 11th February, 1924, sixty-one experiment plots, of size varying from $\frac{1}{10}$ to $\frac{1}{4}$ acre, were laid down in various cane fields in the district of Cairns. Fumigation of the treated plots was made with a hand injector designed by the writer for this purpose; while the doses of paradichlorobenzene used varied from $\frac{1}{16}$ to $\frac{1}{4}$ oz. (apoth.), and in most cases were buried $4\frac{1}{2}$ inches deep, 12 to 18 inches apart, and 4 to 6 inches from the cane stools. Thus, the quantities used per acre varied from about 60 to 200 lb., which, however, comprised several brands, differing in price and quality.

Most of these plots were fumigated during the month of December, several in January and February, and a few in November.

The cane varieties treated were mostly D.1135 and Badila, which had been planted during July, August, and January.

Sixteen field plots fumigated with paradichlorobenzene, but which were not grub infested, served to illustrate the fact that this chemical has no injurious effect whatsoever on the ultimate growth and development of the cane, seeing that the stools on all of these test plots were found at the end of the growing season to be equally as fine and healthy as those on a similar number of check plots alongside each of the fumigated areas.

On the other hand its effectiveness against cane grubs, when these were present, was amply demonstrated on plots at Worree, Meringa, and Highleigh (see Bulletin No. 19, pp. 39 to 47, Division of Entomology).

Success of Paradichlorobenzene in Russia against Scarabæid Grubs in Vineyards.

It will be of interest to mention that this fumigant has recently proved successful in Russia for destroying grubs of *Polyphylla fullo* L. a cockchafer which is very closely related to our own greyback cane beetle. The following extract from an article published in 1927 (Kiev. Nat. Commiss. Agriculture) gives a brief account of the method of applying this fumigant in Russia:—

“Paradichlorobenzene has proved effective for the control of *Polyphylla fullo* L. in the vineyards of the Lower Dnieper. Other larvæ occurring in the soil are also killed. It should be used at the time of planting out the young vines, which should be set at a distance of 21 inches, in rows 7 feet apart, and the fumigant should be placed in holes 21 inches apart, the lines of holes being also 24 inches apart. The paradichlorobenzene is applied at the rate of about $\frac{1}{4}$ oz. to each hole at a depth of about $3\frac{1}{2}$ to 4 inches and covered with soil. This applies to sandy soils; in heavier clay soils the dosage should be increased to about $\frac{1}{2}$ oz.

“Both larvæ and pupæ are killed by this treatment; oviposition seldom occurs in treated soil, and if eggs are laid the larvæ are killed soon after hatching. The effect of the fumigation lasts throughout the summer and does not injure the young plants.”

Note.—The above recommendations as to weights of doses, distances apart, and depths of injections are practically the same as those which have long been recommended by our own Sugar Bureau for combating the grubs of a very similar species of cockchafer—viz., the notorious greyback beetle of our Northern canefields.

It is certainly very interesting to learn that the successful results now secured against *Polyphylla fullo* L. in Russia are practically the same as were obtained by us with paradichlorobenzene during the years 1923-24, which the reader will find reviewed under another heading in the present monthly report.

For the control of root-eating grubs in canefields, see full details given in the “Queensland Agricultural Journal,” vol. xxix., pp. 97-113.

If you like the “Journal,” kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

FIELD EXPERIMENTS AGAINST GRUB INFESTATION.

The Assistant Entomologist at Mackay (Mr. A. N. Burns) has submitted the following report for the month ended 12th November, 1928, to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby):—

Field Experiments against Grubs at West Plane Creek.

Continuing a series of experiments commenced by Mr. R. W. Mungomery in February last, in accordance with a request made by the Plane Creek Central Mill Company and some of the West Plane Creek growers, a grub survey was carried out in order to establish a suitable location for laying down several fumigation plots.

In the summer of 1927 practically all the farmers at West Plane Creek suffered severe loss of cane through grubs of the greyback cane beetle (*Lepidoderma a bo-hirtum* Waterh.), and, in consequence, when the beetle emergence of the 1928 summer took place, hand collecting of beetles was largely resorted to, and the feeding trees in the immediate vicinities of canefields were in many cases destroyed. These factors, combined with the abnormally wet season, were most probably responsible for the marked decrease in grub infestation in this area this season. It was, therefore, fairly difficult to locate a site where conditions were most favourable for experimentation, the principal drawback for fumigation tests being that grubs were not present in large numbers. A spot was decided upon, however, and four plots (with controls) were put in. Results of these are summarised hereunder.

Paradichlorobenzene (Crude Quality).

This plot comprised seven rows each 1 chain long, fumigated with $\frac{1}{8}$ -oz. doses on either side of the cane stools. Doses were placed about 3 inches deep and from 3 to 4 inches away from the stools. A control block containing six rows of cane on the southern side of the treated plot was marked out. The final inspection of this plot (11th October, 1928) showed that the fumigated cane was erect and green and in every way superior to that in the control area, and more particularly when compared with the adjoining cane on the northern boundary, which presented a very withered appearance. This, as well as all the other plots, received $5\frac{1}{2}$ inches of rain a few hours after injecting, so this may have had a slight influence on the results obtained.

See-Kay.

As the Plane Creek Central Mill Company had a sample of this material on hand, a request was made to fumigate a few stools with it whilst the other plots were being injected. Accordingly two rows, each 1 chain long, and adjoining the paradichlor. control plot boundary, one on either side, were injected with $\frac{1}{8}$ -oz. doses placed on either side of the cane stools, 3 inches deep, and about 3 inches from the cane plants. Considerable difficulties were experienced in injecting this plot, as the see-kay was very moist and sticky, and contained large masses of a gelatinous substance, which prevented free injection. A quantity of the freer material was separated and used, but this, however, still being sticky, gave much trouble in injecting. A final inspection (11th October, 1928) of this plot showed that the two-treated rows of cane were considerably greener and better than the cane in the adjoining control blocks. The contrast, however, was not as marked as that obtained with the plot fumigated with paradichlor.

Carbon Bisulphide.

Five rows, each one chain long, and adjacent to one of the "See-Kay" rows on the southern side, were injected with $\frac{1}{8}$ -oz. doses of this fumigant. The doses were applied on either side of the cane stools, to a depth of 3 inches, and from $2\frac{1}{2}$ to 3 inches away from the cane plants. At the final inspection of this plot (11th October, 1928) the results were somewhat disappointing. Very little difference was discernible between the fumigated cane and the cane in the adjoining control block. The cane was poor in both plots. In the case of this, and the following experiment, no doubt the precipitation of $5\frac{1}{2}$ inches of rain a few hours after injecting would materially affect these plots; results should, however, have been better, as both plots were reinjected in fine weather some two weeks later.

Carbon Bisulphide and Paradichlorobenzene (Saturated Solution).

A request was made to treat a small area with a mixture of the above two fumigants, as good results had been reported at different times from their use in Northern canefields. A plot of five rows, each one chain long, was therefore fumigated with $\frac{1}{8}$ -oz. doses placed each side of the cane plants; 3 inches deep and from $2\frac{1}{2}$ to

3 inches away from the cane plants. As stated above, owing to the very heavy rain that fell almost immediately following fumigation, this plot was reinjected some days later. The final examination of this plot (11th October, 1928) did not reveal as good a result as had been anticipated, the difference between the treated cane and the control area alongside being only slight. The adjoining cane on the southern boundary was decidedly more withered, but the comparison with the actual control block (which was on the northern side) was not so marked.

Emergence of Frenchi Beetles (*Lepidiota frenchi* Blkb.)

Following a fall of some $1\frac{1}{2}$ inches of rain spread over a period of three days (5th, 6th, and 7th instant) a small emergence of these beetles occurred at the Experiment Station and grass lands adjoining. The beetles commenced to leave the soil at dusk (about 6.50 p.m.) and continued to fly about for some twenty minutes or so, by which time most of them had mated and become quiescent. By 8 p.m. only isolated specimens were to be noted resting on cane plants, low bushes, &c. A large number of the beetles was collected, and it was interesting to note that these were all considerably undersized, and were paler in colour than is usual. They had evidently emerged from their cells before they had properly "hardened up" as their elytra and bodies were quite soft, and the white dusted scales on their bodies usually so noticeable in this species were only faintly visible. This may be confirmed by the results of observations made from specimens being bred in cages at the Laboratory, where the actual emergences from pupæ were about that time taking place. The examples, too, that emerged in this flight could only be those that had pupated close to the surface, as the rain had penetrated to a depth of only about 8 inches. The beetles being undersized is probably accountable from the fact that from last June up to the present fall of rain, the precipitation for these five months has been only 1.17 inches. Flying at the same time as the "frenchi" beetles were odd specimens of the Dasygnathus Beetle (*Dasygnathus australis-dejeani* Boisd.), the Isodon Beetle (*Isodon puncticollis* Macleay), and a small species of Melolonthid, probably *Haplonycha* sp.

Occurrence of the Common Cane Skipper (*Telicota augias-kreffti* Macleay).

During the past few weeks the larvæ of this butterfly have been unusually plentiful in canefields on the leaves of young plant and ratoon cane. The writer has not before observed them in such numbers, and so widely distributed; in one instance no less than six larvæ were taken from one cane plant.

The eggs are deposited singly on the upper surface of cane leaves and shoots; they are of a yellowish pink (sometimes entirely yellowish) colour, slightly flattened at the top, and, if viewed through a lens, will be seen to be ribbed longitudinally. The period of incubation occupies from six to eight days. The young larva on emergence from the egg is creamy green with the head black. After the first moult, the head becomes brown, and the body pale green. The fully grown caterpillar measures approximately $1\frac{1}{2}$ inches in length. Individual examples vary very considerably in the coloration of the head; it is usually pale yellowish brown or light brown without any markings. Some specimens, however, have black markings forming a triangle on the front of the face, and extending from the vertex to the mouth, sometimes enclosing a small brown spot just above the mouth. The apex of the triangle is situated at the vertex. One example was taken recently along with many others, which had the head entirely black. The body is always translucent apple green, sometimes slightly suffused yellowish. Occasionally specimens are met with having a small black spot on the anal plate, dorsally. Larvæ shelter within portion of a rolled leaf drawn together with threads.

The pupa is also enclosed in a rolled leaf; it usually measures about $\frac{7}{8}$ -inch long, though many are less than that. It is pale brown in colour, with a raised black spot on either side of the dorsal area, just behind the head. The head bears a slightly raised rounded cap or operculum; cremaster slightly darker brown, prominent. Sometimes examples are seen in which the abdominal segments are suffused greenish, the green colour showing through the pupal skin from the internal tissues. This stage occupies slightly less than two weeks.

The adult butterfly measures about $1\frac{1}{2}$ inches across the expanded wings, and is coloured as follows:—

Male (above).—Forewing brown-black, cell and base to sub-apical area, including three sub-apical spots; orange; distal area, composed of confluent spots, orange; cilia, brown black becoming orange towards lower angle. Sexmark prominent, dull black, edged black.

Hindwing brown-black, a large cellular spot and a broad irregular distal band, orange. Cilia, orange.

Beneath.—Forewing brown-black, apex and outer edge suffused orange brown, a large cellular spot and three spots near outer edge, orange yellow. Spots on upper side of wing faintly visible.

Hindwing orange brown, cellular spot and markings near outer edge as above, but paler and suffused brownish.

Female (above).—Forewing dark brown, a large cellular spot extending to beyond middle of wing, orange, three sub-apical spots, orange, a band of irregular orange spots near the outer edge. Cilia, brown-black; yellow near hind margin.

Hindwing dark brown, a small cellular spot, and distal band of confluent spots, orange. Cilia, orange.

Beneath.—Forewing as in male, markings near outer edge narrower.

Hindwing as in male, markings near outer edges narrower.

This butterfly feeds naturally on blady grass (*Imperata arundinacea*) and has a very wide range, extending from Illawarra to Cape York. The true *Telicota augias* (Linn.) occurs in Java.

FIELD REPORTS.

Mr. J. C. Murray, Southern Field Officer, has submitted the following report for the period 12th September to 12th October to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

GIVELDA.

The cane here looks well, but rain is needed to bring up the newly planted areas. Cane varieties growing are M. 1900 Seedling, Q. 813, H.Q. 285, Black Innis, and D. 1135. High c.e.s. values are being obtained for all of these.

In ratooning Q. 813 farmers are recommended not to use implements too vigorously and to be careful not to touch the stool. The root system of this variety is small and the stool is easily dislodged.

A considerable amount of fertilising has been done in this locality, the results indicating the value of potash. However, the growers have no really definite information as to which manure works the best, because so far they have carried out no local experiment. In regard to making a manurial experiment on his farm a grower would possibly reason as follows:—"I am not getting the tonnage I should get, yet the ground is well worked, the rain has fallen fairly regularly, and there is no serious disease. My soil must be getting short of plant food. When I come to think matters over, I have been on this farm for fifteen years and have put nothing back into it. It is obvious this is not a good state of affairs."

The farmers must then think of two things—what to apply and the method of application. The latter question requires careful consideration, as the practice of manuring has shown. There are three accepted methods—placing manure in the drills; drilling about a foot away from the cane when the plants or shoots are about six weeks old; and broadcasting on the interspaces. The latter method has a good deal to recommend it, as an even distribution of fertiliser is obtained over the field. Once a cane crop is well established the roots are taking tribute from every inch of soil. Experiments with manures should be combined with methods of application. Fertilisers that are a source of nitrogen (sulphate of ammonia and nitrate of soda) should not be applied unless conditions are moist. Farmers are recommended to green manure on the Givelda soils.

MULLET CREEK.

The cane in this locality appears to be good, although in some instances the c.e.s. values are not absolutely satisfactory. This applies more particularly to the E.K. 2 and D. 1135. Other varieties growing are B. 208, M. 1900 Seedling, H.Q. 285, and Q. 813; Q. 855 was also noticed coming to the siding. There is a considerable improvement noticeable in regard to transport facilities in the Mullet Creek area, the majority of the farmers now hauling with motor lorries.

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The following recommendations are made to growers in the Mullet Creek district. Whatever cane the farmer decides to grow he should be very careful to get healthy plants. On the state of the set and the quality of the early cultivation depends very largely the success of the ratoon crop. Make the plant crop vigorous, and with few exceptions, good ratoons will be obtained.

Manuring, but only after local experiment, should be practised. Chance application of commercial fertilisers is not at all in the best interests of the growers of sugar-cane.

WALLAVILLE.

The cane on the line between Goondoom and Wallaville looks very healthy, but rain is wanted. Very fine cane of high sugar content can be grown on these dark soils. The railway is convenient for the farmers, the department having an excellent service with a siding every mile or so.

Cane varieties making a good showing here are M.1900, Meerah, Q.813, H.Q.285. Unfortunately, Meerah is a variety susceptible to gumming disease, therefore the growers are advised to be cautious about planting it.

BAROLIN.

The soil in this area has retained its moisture splendidly in the face of a spell of very dry weather. Rarely can dry soil be found at a depth of eight inches. The cane is striking well and is healthy. If rain comes reasonably soon there should be a good summer showing of cane. The farmers are doing a certain amount of fertilisation, mainly bonemeal and potash.

Canegrowers often inquire as to the difference between steamed bone and raw bone. The following particulars will be of value to them:—

Raw bone contains about 4 per cent. of nitrogen and 22 per cent. phosphoric acid, about 5 to 7 per cent. of which is soluble, the rest being insoluble. The phosphoric acid in raw bone is slowly available to plants, its usefulness extending over several years.

Steamed bone has been so treated to free it from fat. Fat is more or less objectionable in a fertiliser. Steaming reduces the nitrogen in the bone so that it contains about 28 to 30 per cent. of phosphoric acid and about $1\frac{1}{2}$ per cent. of nitrogen. About 6 to 9 per cent. of the phosphoric acid is available. Steamed bone can be ground much finer than raw bone and this greatly increases its value for immediate use.

Generally, the prospects are good. The standard of farming is high, although all interspace work is taking longer than it should—that is, if it is done thoroughly. Full width distributions for interspace manuring are also required. These should be simple and cheap. A hopper box supported by two sulky wheels with rakes behind will answer the purpose.

The small grower should be careful not to impose an undue burden on himself with machinery. Over capitalisation should be carefully avoided.

Mr. J. C. Murray, Southern Field Assistant, reports, 19th November, 1928:—

The spring has been dry, consequently the cane planted after the winter has been very slow in coming up. Notwithstanding this, the percentage of misses will not be high. All the mills have had to reduce their original estimates, but this has been compensated for by the high c.e.s. value of the cane. It is very much better to grow small crops of high sugar value than big crops low in c.e.s.

THE ISIS.

Autumn Plant.—Growing well, but affected by dry weather. Apparently free from serious percentage of disease infection.

Spring Plant.—Striking slowly and rain wanted. This has been a puzzling spring for the growers, the early part being much too cold to plant, and as the soil warmed the weather became increasingly dry. It is probable that the spring plant cane will be satisfactory.

Ratoons.—Ratoons this spring are very good. In most fields the shoots grew without any evidence of shyness. The most vigorous observed were the Black Innis

ratoons. This cane is coming into favour in this district. It is a variety that stools and ratoons with quick-growing qualities and a good sugar content.

Standover.—There was not much standover cane in the Isis area. It cut in good condition with a high average c.e.s.

Cane varieties looking well in the Isis district are:—N.G. 147 and N.G. 103 on Mr. Garnstrom's farm at South Isis, E.K. 28, M. 1900 Seedling, Black Innis, Q. 813, and H.Q. 285. As standover canes N.G. 16 and Badila are making a good showing. It is worth noting by cane-growers that Black Innis is thought to be identical with M. 189 (see "Varieties of Sugar Cane in Queensland," 1926, Bulletin No. 2 of the Bureau of Sugar Experiment Stations).

The two first named are making a good showing. N.G. 147 was introduced by the Bureau of Sugar Experiment Stations from New Guinea in 1912, as also was N.G. 103. Both these canes were again brought in from New Guinea in 1914 by the C.S.R. Company. Following are descriptions:—

N.G. 147.—Habit—erect; internode—barrel shaped; waxband—heavy; eye-groove—long and shallow; leaf-scar—prominent; eye—strong, medium-sized, well defined; trashes—freely; root system—light; colour—dark brown.

N.G. 103.—Colour—olive green, with light red to brown-coloured stripe; habit—erect; waxed—heavily; internodes—barrel shaped; eyes—medium and pointed; stooler and germinator—good.

Another variety that is making very good growth is E.K. 28. When thinking of cane varieties, farmers should remember that no man can speak with any authority unless he has had a cane under observation for at least six years. There is an inclination in recent years to make definite pronouncements prematurely regarding sugar-cane varieties—pronouncements perhaps on one season's observation. This is very foolish and misleading, as is amply shown when varietal resistance to disease is spoken of.

BOOYAL AND DALLARNIL.

Farmers in these areas are well satisfied with their crops from a c.e.s. point of view. The cane was light owing to the dry weather. No hitch has occurred throughout the crushing season. Regarding varieties and general agricultural conditions, there is nothing fresh to report since last visiting these places.

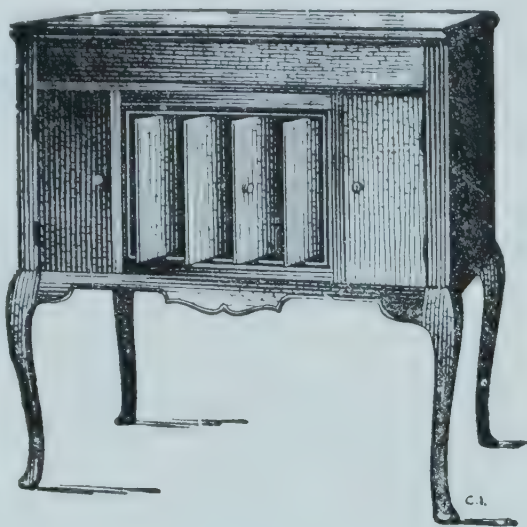
MARYBOROUGH.

Crushing here proceeded smoothly throughout the season, and farmers appear to have had satisfactory returns. The cane is ratooning very well. The plant cane is also satisfactory. The industry here is on a small scale, but is nevertheless in a promising position. Interest is now taken in better varieties, the wiping out of disease, and the use of fertilisers. There are still some cane varieties that should not be grown in the Maryborough district. When planting again, growers are requested not to grow Meerah, Rappoe, or Striped Singapore.

Some of the land requires draining. The best kind of drain on the river flats would be what is called a ditch drain. This should be about 2 feet deep and about 8 feet wide. All kinds of farm implements can pass over a drain of this description. It is the most serviceable wherever it will drain the land sufficiently. The grade of an open ditch must necessarily be low, otherwise the soil will wash. A fall of about 6 inches is enough. Curves should be very gradual, especially if the fall is greater than this. If a ditch of this description were running full after heavy rain, the water would be flowing at about 7 miles per hour. It is best, therefore, to build these ditch drains with a very gradual fall. Plant grass in them, if possible. It would appear that a drain of this type takes up a lot of land, but it should be remembered that badly drained land is the cause of heavy loss to Queensland farmers.

PIALBA.

At the time of visiting this district wagons and lorries were beginning to come in with a flag of green tops, indicating the last load. The season's operations have been smooth, no hitch occurring during the crushing. The weather has been very dry, nevertheless the ratoons are making an excellent showing. There should be a very good ratoon crop here next year. Regarding cane varieties, there is nothing fresh to comment upon since last visit. Probably the highest c.e.s. values were obtained from Q. 813.



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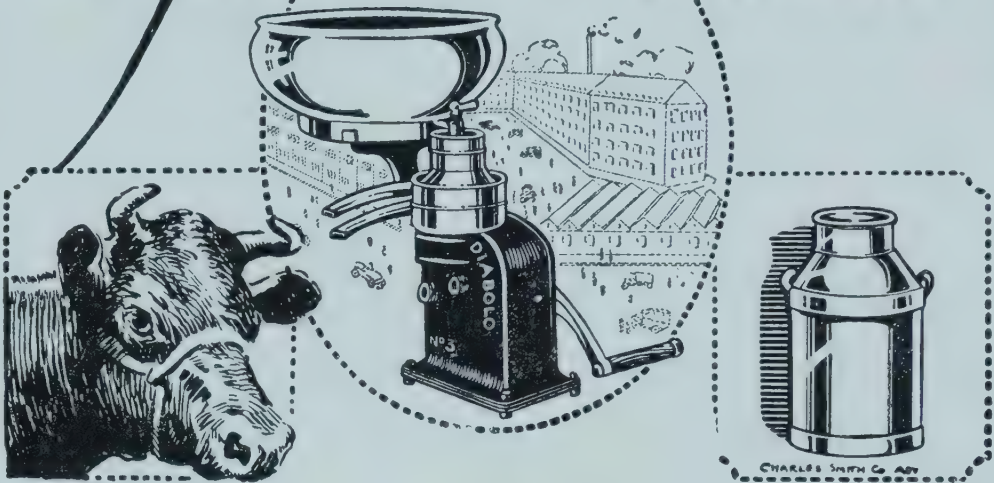
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The Northern Field Officer, Mr. A. P. Gibson, has submitted the following report on the important sugar-producing area of Innisfail, for the period 17th September to 19th October, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Weather.

The weather for this period has been warm, dry, and dusty. Tanks are empty, wells are failing, water for domestic use is scarce, and is being carted, costing 8s. per 100 gallons, and there is much sickness. A good general rainfall is urgently required.

1928 RAINFALL.

				Innisfail. South Johnstone Sugar Experiment Station.	
January	..	..	..	15.45	11.12
February	..	..	..	26.25	26.82
March	..	..	..	34.50	30.72
April	..	..	..	5.90	7.90
May	..	..	..	9.07	8.68
June	..	..	..	1.73	1.26
July	..	..	..	5.15	5.11
August	..	..	..	3.78	3.66
September	..	..	..	0.02	0.12
October (to 22nd)	..	..	..	0.08	0.00 (to 13th Oct.)
				101.93	95.39

The Crop.

The district crop is composed mainly of Badila; this kind possesses the qualities of a good all-round cane on the better Northern lands. At the moment the crop is expected to yield about 42,000 tons more cane than that milled in the season 1927. Obviously, this tonnage would have been much greater had not cane grubs, weevil borers, and premature arrowing seriously affected its growth. The dry harvesting time has, however, permitted its quick removal, and at the same time proved favourable for its ripening. Sometimes crops experiencing abnormal growth, owing to drought or early tasseling, ripen speedily. When the ripening period is short, the cane becomes over-ripe and loses its sugar. Should nothing unforeseen happen, little, if any, of the 1928 crop will be left by the middle of December.

MILL ESTIMATES.

			Cane Milled, 1927.	Cane Estimated, 1928.	Approximate Tonnage of Cane Crushed.
			Tons.	Tons.	
South Johnstone	..	..	156,340	178,000	(to 13th Oct.) 128,000
Mourilyan	..	..	164,882	160,000	(to 13th Oct.) 100,000
Goondi	..	..	151,430	177,000	(to 29th Sept.) 119,000
			472,652	515,000	347,000

Cultivation.

The use of tractors, big and small, is ever increasing. They are foremost in hastening operations, and in cheapening most of the field work. They have taken the place of horses in hauling the loaded cane trucks from fields to permanent ways. Sometimes the field line is damaged, the result of a careless, inexperienced driver. Rotary hoes or cultivators are increasing in popularity; they may be attached to most modern wheel or caterpillar types of tractor. The chief uses are as follows:—

- Finely dividing exhausted cane stubbles, before ploughing;
- Tilling early the soil between the cane rows;
- Chopping trash to pieces, before it is ploughed in;
- Early weed destruction on headlands or resting fields;
- Shaving the surface of improperly harvested or high stools. This operation requires common sense, otherwise damage instead of good will result—the hoes should be kept reasonably sharp. Several farmers still toil with the old bow and arrow type of cultivation.

Pests and Diseases.

These are responsible for much deterioration or total crop destruction. The essential preliminary to the abolition of these is to outlaw them. They continue to spread, mainly, by indifference or ignorance. Cane grubs and the weevil borers in parts still are formidable pests. Rats, army caterpillars, and the larvæ of the big top moth and tineid moth borer also were noted. Leaf Scald is widespread and very severe in H.Q. 426 and Goru family of canes at Silkwood and El Arish.

Fertilising.

The quantity used is annually increasing. Different quantities, different manures, and different methods of distribution were noted. The time of application so that the crop derives the best results is ever a problem. Lack of moisture for the present may hinder the finer cane roots assimilating the fertilisers which are being added.

Green Manuring.

This is not grown to the extent that it deserves to be; the soil in this region—especially the porous red—seems to be lacking in organic matter. The growing of leguminous crops and the ploughing in of trash, where practicable, are highly desirable for its improvement.

MOURILYAN.

The management of this mill keep on trying to improve factory conditions.

Milling.

The variety almost entirely grown is Badila. The harvesting of some Pompey (7 R. 428) has been purposely delayed and an increased sugar content resulted. The factory is milling clean cane of high quality. Its crushing rate per hour and the mill efficiency are greater than ever before; 51.8 tons of cane are being crushed per hour, 7,002 tons of cane being the greatest amount treated in a 44-hour week. The mill average c.c.s. for the week ended 13th October was 15.92 per cent.; for the season to date, 14.14 per cent.; 7.23 tons of cane were wanted to make one ton of sugar. Only 0.8 per cent. of the crop has been fired before harvesting; this is most satisfactory. Work in the field is being hurried along; the weather being dry for so long there should be no excuse for grassy or poorly tilled crops. Pests, though severe in isolated parts, are fewer here than in neighbouring mill areas. Despite the long and prevailing dry weather the new crop looks wonderfully green; the curling of the leaf suggests that it is in serious need of moisture. Recently planted cane will suffer more than that planted and established; the dry hot soil will rob the plant of its moisture, when it will become weak, or completely perish.

SOUTH JOHNSTONE.

Much of the 1927 crop was late cut and was short of stem when it tasselled. This, and severe grub and weevil borer destruction, reduced the first estimate by fully 20,000 tons. There is much undulating, volcanic, red, rather porous soil in this area, and the planting of cover crops would improve its fertility and retard plant food leaching; this at the moment is just a patchwork of striking colours. The crop growing on high and low land is now showing signs of distress.

The main kinds of cane grown are Badila, H.Q. 426, and some Goru. The two last mentioned are much diseased in parts, and in some instances are grown on Badila land. The Goru family of canes should be entirely ruled out, and more attention should be paid to the selection of healthy and pest-free seed. If the farmers could be induced to pay more attention to this and refrain from using different varieties for filling the vacant spots in plant cane, the area of disease would be considerably lessened. Some cane ratooned poorly. The perishing canes are good breeding places for the borer, and, also, are likely to cause dry rot in the stool.

The mill has been working for some time now; it was not working full time when the area was inspected, owing, it was said, to some gangs refusing to harvest certain cane crops until fired. The greatest amount of cane treated in a 48-hour week was 7,329 tons, and in a 44-hour week, 6,890 tons.

EL ARISH.

Here the growers are returned soldiers; they produce about 30,000 tons of cane annually. The bulk of the harvested cane is sent to nearby railroad stations, whence it is derricked from small to big wagons and railed to the Tully for milling. The prevailing rainless weather has enabled the harvesting and cultural operations to proceed without interruption. Badila is mainly grown. H.Q. 426 and a lesser quantity

of other kinds were noted. Some cane stubbles have produced too long. Lack of money to clear the field of its encumbrances so as to permit the use of the plough has been the major reason for this. More land is being brought under the plough annually. In some instances the cost of production and work of the back-breaking type could be minimised by drawing the scattered field logs together, or, better still, right off the area, thus permitting the judicious and timely use of light interspace implements. Obviously much depends on proper plant selection. Farmers should exercise the greatest of care when selecting their seed. There is overmuch Leaf Scald in the area. H.Q. 426 is seriously troubled with this, and Badila is to a lesser degree. Two stools of Brown Rot were located; bananas, like cane, are also affected with this complaint when grown adjacent to certain kinds of stumps in new scrub land. Weevil borer damage was bad in parts. Larvæ of the big top moth borer and the tineid were noted. Rat injury was more severe along creeks.

Lime.—A small quantity of burnt coral has been used, and the result will be watched with interest.

GOONDI.

The bulk of the available cane to harvest has been cut. Operations in field and mill have proceeded smoothly and well since the beginning. Varieties grown are Badila in the good land and Pompey in the poor. The latter mentioned kind is being reduced as much as possible. Farmers here seem to realise more the great benefits to be gained by green manuring; many resting fields have been planted with Mauritius beans; this, like cane, requires rain. Greater efforts to improve the soil by trash conservation are conducted here; such a procedure is always considered good farming. In some quarters it is regarded as a medium through which some pests and fungi are carried over to subsequent crops, and therefore is better fired. Cane trash is treated in one of the many following ways:—

- (a) Fired;
- (b) Volunteered;
- (c) Relieved; trash drawn off cane stools only;
- (d) Rolling; trash removed to alternate drill and the bared interspaces tilled;
- (e) Ploughing in of trash; best of all, but not practicable at all times.

When trash is left on the surface it decomposes or is weathered, so that the most valuable part of it is lost to the atmosphere.

Grub destruction was severe. This pest seriously undercuts the stubble foundation or rooting system, and the cane rapidly perishes. Early in October, farmers reported having seen some mealy back beetles on the wing.

BABINDA.

Mr. Gibson reports on the Babinda sugar-cane producing areas, inspected 23rd October to 3rd November, as follows:—

Weather and Rainfall.

Hot, sunny, rainless days, with moderately cool nights, were experienced during the month.

January	..	..	13.20
February	..	..	26.24
March	..	..	44.28
April	..	..	6.21
May	..	..	11.06
June	..	..	1.66
July	..	..	5.96
August	..	..	3.84
September	..	..	0.10
October	..	..	0.10
November	..	..	0.34 (to 3rd)

112.99 inches (to 3rd November).

It will be noted that very little rain has fallen during the last eight weeks, which is unusual for the locality, which is recognised as being the wettest in Queensland. This abnormal stretch of hot, dry weather parched the vegetation and diminished

the water in the creeks, but, providing it does not last too long, will be a blessing in disguise in so far as cane culture is concerned, for the following reasons:—

- (a) It has maintained the crop sweetness and permitted it to be harvested in a quicker time;
- (b) It has ameliorated the soil and improved its mechanical condition;
- (c) It has enabled farmers to thoroughly till and suppress the weed growth. Furthermore, when rain does fall, the new crop being clean, well tilled, and still growing, must quickly cover the bare interspaces, thus reducing weeding and production costs.

Rising day and night temperatures, accompanied with different sky appearances at the end of October, heralded a weather change. Some rain of a patchy nature fell on the 1st instant; this, though small, will do good and has gladdened the hearts of the farmers.

Babinda is one of the most desirable cane-producing areas of the North, in that it has the soil, the rainfall, the climate, and the field problems are less numerous than those situated where the rainfall is insufficient; the most serious trouble due to excessive wetness is weed suppression and the difficulty in preparing the soil well before planting.

The Crop.

The crop consists mainly of Badila, some H.Q. 426, and a little Goru. At the outset this was forecasted to yield 190,000 tons, which is greater by some 12,000 tons than that milled the previous year, and the estimate still remains at that figure, although grubs, premature arrowing, and weevil borers more or less damaged or retarded the growth.

Harvesting and Milling.

The end of the season is in sight. Ideal conditions for the greater part have prevailed for harvesting. Severely grub-damaged crops were harvested early; the lighter crops now are being fired before cutting. Operations in field and mill have progressed smoothly and well; there has been an adequate supply of cane, and in consequence record weekly tonnages have been treated, which has enabled the factory to treat a greater tonnage in a shorter time. The general quality of the cane has been good; 157,000 tons have been milled to 3rd November, and it is expected the balance of about 33,000 tons will have passed between the crushers by 7th December.

Cultivation.

The long stretch of dry weather has permitted constant tilling, the area, generally speaking, is therefore cleaner and in a better order than previously. It is clear that the cleaner fields and their surroundings must, with the improved crop husbandry, result in an increased 1929 crop yield. The area on which the grub-destroyed cane was cut early was speedily ploughed and immediately replanted. Most of the plant cane was early planted, and its germination on the whole has been satisfactory.

Drainage.—Several growers have improved their canefields by draining.

Fertilisers.

Our canegrowers are beginning to realise the great value of fertilisers, and also the benefits to be gained by early application. To secure a well-balanced plant foot mixture and one suitable for different canes and soils is always a problem. Cane and soil analyses, together with carefully laid out field plots, should afford some interesting and valuable assistance. Sufficient moisture to act as a solvent is required, so that it may be early assimilated by the roots. Fertilisers should be applied within three months from planting or cutting; two dressings, though more costly, are often better than one.

Filter Press Cake.

The value of this spread over the less fruitful spots is not understood. It contains some lime and phosphates removed from the cane juices. Its scarcity, together with the cost of application and increased weed growth, are the main objections to its use. If weeds grow, so must the cane, and the faster it grows the sooner will it cover the interspaces. It is beneficial broadcasted over resting fields and mixed with the soil by subsequent cultivation. Increased plant germination and growth may be had by placing same in cane drill with seed. The use of too much must be guarded against.

Diseases and Pests.

Leaf Scald was very bad in Goru, bad in H.Q. 426, and was found in most Badila fields. The first-named cane has served its purpose in some places and should now be eliminated. Weevil-borer destruction is too severe, and is increasing in spite of the fact that its parasite is widespread at present, and is abundant. Trashed cane is more affected than is untrashed. Numerous beetles and larvæ were found in some perished and dissected cane stools. The flies are reduced in number when all the cane is harvested, so it is late before they increase sufficiently to offer much resistance, therefore the breeding of one of our most dreaded cane pests is interrupted but little. Quarter-acre patches of borer-infected cane should be permitted to remain throughout the district, and if done should insure a larger supply of early flies.

WAUGH'S POCKET.

Most of the available cane for milling is harvested. The new crop, though possessing a good colour and making satisfactory progress generally, has not received any interspace cultivation, and in consequence the soil is now refractory. Leaf Scald and weevil borers have been noted, and the liberation of tachinid flies is recommended. Apparently there is much good soil in this district. The progress of this pocket is hindered owing to its not having a trafficable road.

Prospects for 1929 are promising at present for another good crop; but some rain is wanted to ensure its continuous growth.

TICK CLEANSING OPERATIONS.

Mr. W. Forgan Smith (Acting Premier and Minister for Agriculture and Stock) announced recently that tick cleansing operations were being carried out under a scheme in which the Commonwealth, New South Wales, and Queensland Governments were co-operating. Each of the Governments had appointed a representative to a committee that is known as the Cattle Tick Control Commission, and the first meeting of that Commission was held in March, 1927. This committee has been entrusted with the control of tick cleansing operations.

It was arranged that the tick cleansing operations would be commenced in New South Wales, the intention being that when that State is cleared of ticks, the work would be extended to Queensland.

Systematic attempts are now being made to eradicate the tick in the Northern Districts of New South Wales. The Minister stated further that the chairman of the Tick Commission, at a meeting held recently, mentioned that many stockowners were of the opinion that ticks were still being introduced into that State through tick-infested cattle in Queensland being allowed to run on country adjoining the New South Wales border, and the chairman suggested that a survey might be made of the country adjoining the New South Wales border for a distance of, say, five to ten miles, and particulars obtained as to the approximate number of cattle running on this area, in order that, at a later period, this portion might be dealt with. No action beyond that indicated above has been taken in this connection.

Immediately that the New South Wales territory is rendered free from ticks there will be full justification for Queensland to devote closer attention to the work of tick eradication within this State.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

The Banana Weevil Borer in Java, with Notes on other Crop Pests.

By J. L. FROGGATT, B.Sc., Entomological Branch.*

I have to submit the following report of my visit to Java to study the position of the banana weevil borer (*Cosmopolites sordida* Chev.) and to search for and, as far as possible, study any parasites of or predators on that pest, and if practicable to forward supplies of such to Queensland.

The report has been written in two parts, the first dealing with the subject of the banana weevil borer, and the second treating of matters relating to sugar, tea, coffee, &c.

Leaving Brisbane on the 26th May, 1928, I arrived at Batavia on the 11th June. After arranging financial matters and presenting my credentials to the British Consulate, I left for Buitenzorg the following morning, where I presented letters of introduction to the Director of the Department of Agriculture and Commerce, Dr. Barnard, to the Director of the Department Landbouw, Dr. den Berger, and to the Acting Director of the Institut voor Plantenziekten, Dr. van der Goot. At the Institut a room was very kindly given me and every facility offered for carrying out whatever investigations I wished to make. In reference to banana culture, &c., I was introduced to Heer Ochse, who extended me all facilities possible for obtaining the information desired, and also later made all necessary arrangements for supplying the bulbs of selected varieties of banana plants for introduction into Queensland.

After spending about a fortnight on investigational work in and around Buitenzorg, I arranged, with the advice and co-operation of Dr. den Berger, a trip through to Banjoewangi, calling at Bandoeng, Garoet, Pasrocen, Malang, and Djoeja on my way. Through the courtesy of Dr. den Berger, the agricultural officers in each centre took me round their respective districts and supplied me with local information. Leaving Batavia on the 20th September, 1928, I returned to Brisbane on 4th October, 1928.

PART I.

The Banana Plant in Java.

Bananas were found to be grown in all campongs, agricultural settlements, throughout the districts visited during my trip through Java, the fruit constituting one of the important foods of the natives. In only one section of the island—namely, the Banjoewangi area—are bananas grown for export, and even there they are grown by the natives and supplied at a fixed price per bunch to the exporter at the wharf at Banjoewangi.

It is not the general practice to set aside definite sections of the campongs for the growing of this fruit alone, and cultivation such as is carried out in Queensland was not observed anywhere.

The banana plant appeared to grow to the best advantage in situations where the ground was sheltered from the full force of the heat of the sun. Wherever it was growing in exposed situations, both the growth of the plants and the bunches from them were less prolific than where they were more sheltered.

* This article comprises the major part of a memorandum prepared by Mr. Froggatt on his return from Java.—R.V.



W. Helmsing
1928

PLATE 147.—PREDACEOUS ENEMIES OF THE BANANA WEEVIL BORER IN JAVA.
Chrysopila ferruginosa (Wied.).—1, Eggs, $\times 15$. 2, Larva, $\times 3$. 3, Pupa, $\times 3$.
 4, Imago, $\times 3$.
Plaesius javanus (Er.).—5, Eggs, $\times 2$. 6, Larva, $\times 2$. 7, Pupa, $\times 2$.
 8, Adult, $\times 2$.

Although a number of varieties of bananas are known in Java, there are relatively few that are held in general favour for consumption by the Europeans. I was informed that the list of known varieties does not apparently represent all that are grown by the natives, as others are being recorded from time to time.

The banana, being so universally grown for local consumption, calls for no special attention as long as the supplies are adequate for the demand. Furthermore, if a plant becomes sickly it is very readily replaced; all that is required is to dig a shallow hole, into which a medium-sized plant, dug from a nearby stool, is placed, and cover the bulb over with soil and ram it firm. On account of no detailed study having been made of this crop, I was unable to obtain definite information on the time taken from planting to bunching, and from bunching to the cutting of the fruit, although it would appear that the full period is less than twelve months. This would, of course, show a variation with the age of the plant selected for planting, this depending on the fancy of the native; apparently there is, however, a variation due to alterations in the climatic conditions at different altitudes. Neither were data available on the length of economic life of a stool.

After a plant bunches, the stalk is either cut off a foot or more above the ground and then cut across into two or three pieces, these being piled against the standing plants, or it is half cut through and left hanging. The subsequent decay of the plant tissue is very rapid, especially in the moister districts of the island.

The Banana Borers in Java.

There are two species of Curculionids breeding in banana plant material in Java, *Cosmopolites sordida* Chev. and *Sphenophorus planipennis* Gylh.

C. sordida breeds in the bulbs and cut stems, while *S. planipennis* apparently confines its activities to the stem tissue after the bunch has been cut or after the plant has died either as a result of attack by *C. sordida* or from other causes.

C. sordida apparently has similar, if not identical, habits to those recorded in Queensland. A very noticeable feature at Buitenzorg, where the climatic conditions were hot and humid, was the very slow rate of oviposition by this species. Very great difficulty was experienced in obtaining sufficient eggs for field testing for the presence of any possible egg parasites.

Sphenophorus planipennis oviposits in the ends of cut stems and in crushed portions giving an entry into the centre of the stem. The larvæ feed particularly in and immediately around the bunch stalk, and later spread through the tissue of the leaf bases. When full grown the larvæ form a relatively thick and tightly matted cocoon composed of the fibres of the leaf base tissue, pupation taking place after a period of quiescence (the prepupal period) inside the cocoon, which is usually embedded in the tissue of the leaf bases. The adult, after emergence, apparently lies comatose within the cocoon for a period before emerging into the rotten plant-tissue.

When newly emerged the beetle is a very light brown in colour with distinct black stripes along the thorax and elytra. The mature adult is a dull black.

S. planipennis is slightly larger than *C. sordida*, and is also much flatter on the dorsal surface, with the thorax showing two lines of

punctate markings. It is therefore readily distinguished in the beetle stage from *C. sordida*.

Field observations in the various districts went to show that up to approximately 1,000 feet altitude the activity of the borers, and especially of *C. sordida*, was comparatively slight, but at higher altitudes they were very much more active. This was most noticeable not only in the relative numbers of larvæ present in decaying stems but also in the relative amount of damage done. I was informed that this fact of the greater damage to banana plants by the borers at the higher levels had also been brought under the notice of the Institut voor Plantenziekten at Buitenzorg. Furthermore, at Malang, as a result of questions put to the head of one of the campongs by Heer de Vries, we were informed that the destruction of banana plants was more pronounced during the wet monsoon than during the dry monsoon. The wet monsoon is reported to be the cooler part of the year in Java. In the campong referred to a plant was found that had been so badly attacked by borers that it had snapped off at ground level as the bunch was being thrown. This campong was at an altitude of about 1,500 feet.

From the general information obtained, partly by report and largely by my own observations, it would therefore appear probable that the hot climatic conditions existing on the lower levels exercise a certain retarding influence on the rate of breeding of *C. sordida* at any rate, since we know that in Queensland the breeding of this pest is very greatly reduced during the summer months.

Both *C. sordida* and *S. planipennis* were met with in all districts visited in Java, and apparently attacked all varieties of banana plants in any one locality to a relatively similar degree.

No egg parasites of either species were found, but the larvæ of the Leptid fly, *Chrysopila ferruginosa* Wied, and the larvæ and adults of the Histerid beetle, *Plasius javanus* Fr. were proved to be predaceous on the larvæ and pupæ of both species of the borers in captivity. This is dealt with later under the account of these predators.

No detailed investigations have been made into the subject of the banana weevil borers in Java, and consequently no information was available at the Institut on their life histories, habits, parasites, &c.; neither has any work been done on measures for the control of the pest.

Predators other than *P. javanus* and *C. ferruginosa*.

Possible predators other than *P. javanus* and *C. ferruginosa* on the borers are two species of Histeridæ, one or two species of Staphylinidæ, and two species of Hydrophyllidæ. These have not yet been specifically identified. Several species of Dermaptera ("earwigs") were fairly common in the rotting banana plant tissue, but no association was proved between them and the borer larvæ.

The smaller species of Histerid was fairly common in rotting banana material, and also in decaying sugar-palm and papaw stems. The larger species was received from the native collectors along with the adults of *P. javanus* and was collected in the rotting banana stems in the Buitenzorg area. This beetle was more active in its movements and took to flight more readily when disturbed than *P. javanus*, but in captivity was not nearly so voracious a feeder on borer larvæ as the latter species. No information could be ascertained on its life history, and the number received of the species in question was not sufficient to warrant its recommendation for closer study with the limited time available for the

general work. The other species of Coleoptera referred to above can, in the light of our present knowledge, be only considered as possible predators of relatively minor importance on the banana weevil borers.

With the exception of the larger species of Histerid, which was only taken in the Buitenzorg area, the other species referred to were found distributed throughout the districts visited.

Plaesius javanus.

In reference to the distribution of this species, no detailed information was available from the records of the Institut voor Plantenziekten. I was informed that it was not known to occur in any of the outer possessions of the Dutch East Indies, but I found it to be generally distributed throughout those areas in Java which I visited. Owing to a combination of unavoidable circumstances, an examination in the jungle in East Java was not possible, but, in view of the fact that this predator is present all through the campongs in the surrounding areas, it is probable that it is also active in the jungle.

It may be stated that, except in the eastern part of the island, the jungle has been practically all cleared away to permit of the very intensive agricultural cultivation practised generally through Java.

Plaesius javanus was not present in the Buitenzorg area in very large numbers during the period over which collections for transportation to Brisbane were made. I was informed that at times it is, however, extremely numerous, thus pointing to a possible seasonal variation in its activities and numerical frequency. In the other districts visited, I found also that it was not as numerous as had been anticipated. The total number of beetles received from the native collectors was 5,757, with an average of 10.1 beetles per collector per day.

The adults (Plate 147, Fig. 8) were found in the tissue of rotten stems or bulbs, either standing in the stools or lying on the ground. The larvæ (Plate 147, Fig. 6) were more generally present in the rotting stems in which borer larvæ were, in most cases, active. Although not actually found devouring the borer larvæ or pupæ, they were often met with in such association with them as to definitely show that they had been actively predaceous immediately prior to being exposed. In captivity both adults and larvæ of *P. javanus* were extremely active in attacking the borer grubs. Neither stage, however, appeared to actively attack the adult weevils, although in one instance a newly emerged adult of *S. planipennis* was destroyed when enclosed in a petri dish with *P. javanus* adults for two days.

As there was no quick and ready means of distinguishing between the larvæ of *C. sordida* and *S. planipennis*, it was not possible to determine the relative degree of attack by the predator on these two species.

The egg (Plate 147, Fig. 5) of *P. javanus* was only collected on one occasion in a campong out from Solo, this being in a stem that had been half cut through and left hanging; in the crushed and decaying tissue where the cut had been made a single egg was found in close association with an adult of *P. javanus*.

A prepupa of *P. javanus* was collected on one occasion in a campong out from Malang in a semi-dry rotted stem. The larva had made a tangled mass of the fibres of the leaf bases, inside which it was lying dormant. In this instance the prepupal period lasted for seven days and the pupal period lasting from 2-3/8/28 until 17/8/28, the beetle being fully coloured by 21/8/28.

In captivity the adults of *P. javanus* were found to attack and completely devour the larvæ of the large Curculionid from palms (*Rhynchophorus ferrugineus* Olivier). This was rather remarkable, on account of the very great disparity in size between the beetle and grub. It may be stated that the beetle was sometimes dislodged at the first attack, but later was always able to obtain and maintain its hold.

In obtaining supplies of this predator for transportation to Queensland it was found impracticable to collect sufficient numbers of the predator myself. Consequently it was arranged, through the courtesy of the Acting Director of the Institut voor Plantenziekten, that the two senior native assistants should arrange for the collection by native boys while the sorting and packing was checked by myself. At first the price paid was 2½ cents (½d.) per beetle, but it was found necessary to increase this to 3 cents, then to 3½ cents, and finally to 5 cents (1d.) per beetle, as the areas nearer at hand became effectively worked over. At the Institut the beetles were kept in tins containing damp moss, and in numbers not exceeding 300 per tin; weevil borer larvæ were placed in with them as supplies were brought in by the boys. During transportation from Java to Brisbane it was impossible to supply them with food, but the cases in which the tins were packed were carried, through the courtesy of the shipping companies (K.P.M. and Burns, Philp) and the ships' captains, as deck cargo, and were kept in as cool a situation as possible and stacked free from any risk of wetting by salt water. Under these conditions the rate of mortality was gratifyingly low in transit.

On arrival in Brisbane they were at first placed in damp moss in jars and fed on raw meat, on which they apparently feed fairly readily, and even more so after the meat had begun to putrefy. Portion of the beetles were later transferred to damp soil, and now all have been transferred to damp soil in tins. This was necessary, as the moss began to rot, and also became contaminated by the rotten meat which was dragged down by the beetles; furthermore, it was almost impossible to examine it satisfactorily for the presence of eggs. In an endeavour to supply them with insect food, Scarabæid larvæ have been obtained from Bundaberg through the courtesy of the Director of the Bureau of Sugar Experiment Stations, Mr. Easterby. These larvæ on being placed in the tins were readily attacked and completely devoured by the beetles. It is hoped that this food, more closely approximating to their natural food, may bring about the deposition of eggs, which, to date, has been known to take place in only a single instance.

The adults are highly predaceous on their larvæ in captivity, as also are the larvæ on one another, but it was not possible to determine to what extent this occurs in the field.

No parasites or predators on *P. javanus* were observed in Java, and none have been found to date on the beetles sent over. A series of dissections made of a small portion of these beetles failed to reveal any trace of any internal parasites.

The length of life of the larvæ is evidently very long. One larva that was not apparently very young when collected early in July pupated on the 12th November.

Owing to the difficulty of obtaining even sufficient food for the predators packed for shipment to Brisbane, the work of attempting to breed larvæ through at Buitenzorg had to be abandoned.

The adults evidently have a fairly long life; of the beetles collected over the period 25/7/28 to 17/8/28 there are a large number still alive and active. They will evidently live under fairly adverse conditions, as at Buitenzorg it was not possible to feed them to repletion, and then they were more than a fortnight without any food in transit. Furthermore, in Brisbane they have necessarily had to be fed on other than their natural food.

At present the rate of mortality of the *P. javanus* adults is very low, as also is the loss due to the exercise of predatory habits on one another.

Chrysopila ferruginosa.

No detailed information was available on this species at the Institut voor Plantenzeikten. I was informed, however, from another source that it had been collected in the Philippine Islands, Celebes, and Borneo, as well as Java. At the time of my visit the larvæ were very plentiful. In the wholesale collection of this predator, native collectors were also utilised, the price given per larva being first 5 cents (1d.), but when it was found to be so plentiful this was reduced to 3 cents; when the numbers received began to fall off early in September, the price was raised to 3½ cents each. The total number of larvæ received from the native collectors was 18,694, with an average of 11.5 larvæ per collector per day.

For transportation to Brisbane the larvæ (Plate 147, Fig. 2) were at first packed two or three together in small tins taken, and sent, over from Brisbane for the purpose, and containing damp moss with a little rotten banana plant material. When this supply of containers was exhausted, tins had to be bought locally; it may be stated that these were not the type which was considered to be the most suitable, but were the only type of small tin that was to be had. The most suitable type of tin was a small square or oblong one, the latter being not more than $2\frac{1}{4} \times 3\frac{1}{4} \times \frac{7}{8}$ inches in size; the lid must be very close-fitting and should not be hinged.

The larvæ were packed in these latter containers at the rate of six per tin in damp moss, together with a little rotten banana material. On arrival at Brisbane it was found that some larvæ during transit had crawled out of these tins into the boxes in which they were packed; when the counts were made it was found that some of the larvæ that had managed to work their way out of the tins in the upper layers had also managed to crawl into tins in the lower layers, as many as thirty-two having been counted from a single tin. This habit of leaving the containers in transit is rather remarkable, because such was not observed while the tins were stacked on my table at the Institut at Buitenzorg; although lying there for twelve to fourteen days only a very occasional larva was found to leave the tins in which they were placed. It could not have been due to overheating, at any rate in the second and third consignments, for the system of packing the tins allowed good ventilation.

During transit the degree of pupation was almost negligible, and the rate of mortality of the larvæ was fairly high.

After being unpacked in Brisbane the larvæ were, as far as possible, kept singly in small glass jars and examined periodically for pupæ. When the supply of small jars was exhausted they were kept in lots of five together in larger jars and transferred to the smaller jars in singles as the latter became available. Within a few days of arrival there was a further mortality amongst the larvæ, and also subsequently amongst the pupæ. In so far as the mortality in concerned, this must, to a certain

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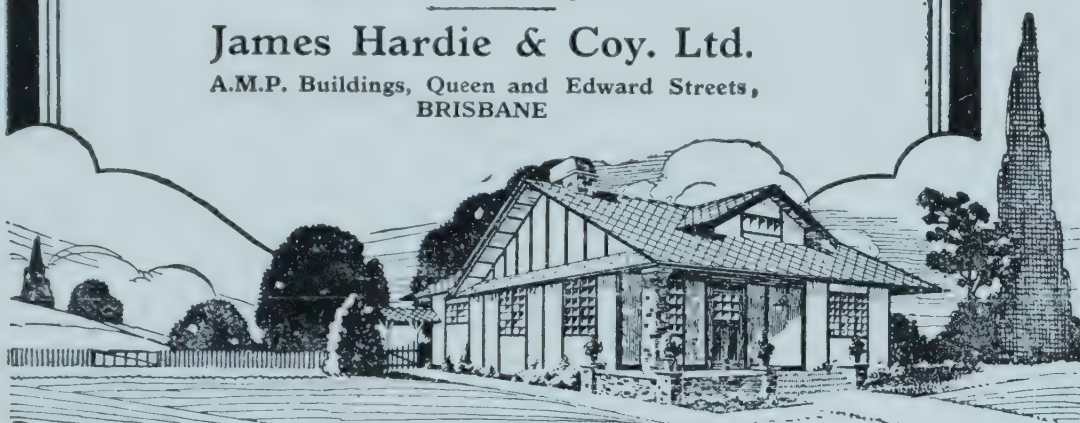
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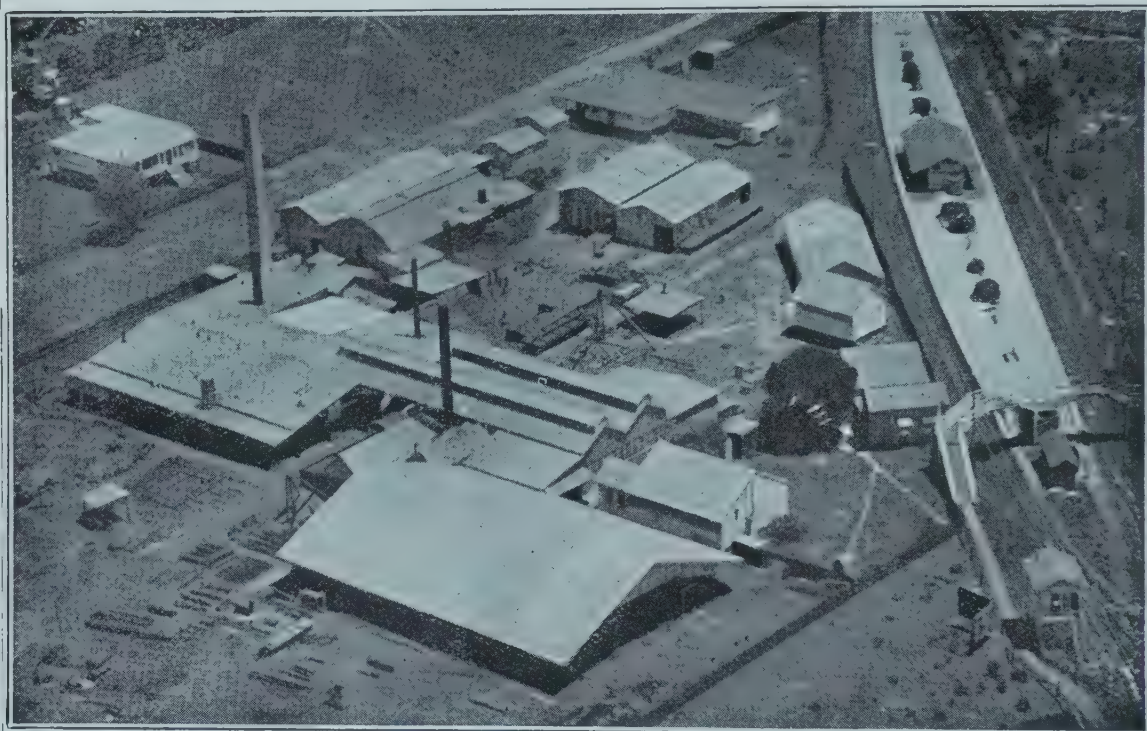
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extent at least, be anticipated, as the transport of the developing stage of the insect, unavoidably without food, and in an unnatural habitat must lead to a serious derangement of the internal economy of the larva; furthermore, under the nature of the system of collecting that had to be adopted some of the larvæ would not be fully developed when sent away, and would naturally not withstand the rigours of transportation so well. Small colonies of the flies have been liberated in plantations in the Cooran district, where there is a considerable area under banana cultivation in contiguous plantations.

At Buitenzorg a number of pupæ collected in the field were kept under observation, and the flies on emerging were placed in a small breeding cage, together with sections of cut banana stem in different degrees of decay. Food was provided by soaking cotton wool in syrup and placing the wet material in a dish on the floor of the cage. The flies fed readily both on the syrup and on the juices of the rotting plant tissue. In the act of feeding, the legs are spread well out from the body, which is then lowered horizontally almost on to the feeding surface; the proboscis is then protruded.

Oviposition took place readily in captivity, but in no case, unfortunately, did the eggs mature. As mating was not observed, it is therefore possible that the eggs (Plate 147, Fig. 1) were infertile. For oviposition, a crevice, or borer hole, in slightly decaying stem tissue was selected; the ovipositor was extruded and curved forwards underneath the body, while the tip, projecting into the crevice, was moved about for deposition of eggs. The whole act was found to occupy about four to five minutes. The eggs were laid in an irregular mass, numbering generally about sixteen, although as many as fifty-nine were counted in one mass. After completion of oviposition, the tip of the ovipositor is apparently cleaned by the tarsi of the hind legs before being retracted.

In captivity, the wings of the flies quickly become broken, due largely to the strong flight of the adults, which dart to the sides of the container, against which they hit with considerable force. It is thus difficult to keep them in captivity for close study. In the cage they usually lived for about seven days.

In the field the larvæ and pupæ of this species were taken in rotten banana stem tissue generally, but not always, in association with borer grubs. In some instances very young, and even well-developed, larvæ were found in such material in which there was little or no signs of borer activity, and in which no borer grubs or pupæ were present at the time of examination. There is no doubt but that the larvæ are predaceous, in very many instances at least, on both species of the banana borer grubs, but further study would be required to determine whether they can develop on a decaying plant diet alone, or are predaceous on other insect larvæ. In some instances it appeared at least possible that they were predaceous on Syrphid larvæ in rotten banana stems, and in one instance on Stratiomyid larvæ in a decaying papaw stem.

Owing to the difficulty of differentiating between the larvæ of the two species of banana weevil borers, it was not possible to determine the relative degree of attack on the grubs of the two species by the Leptid larvæ.

From pupæ collected in the field, a small Dipterous parasite (belonging to the family Phoridae) was bred on six occasions, the larvæ emerging from the Leptid pupa about ten to eleven days after collection;

the pupal period was about seven days. This is apparently a pupal, and not a larval, parasite, as this small fly was not bred from any larvæ kept under observation. As the total number of pupæ under observation was 411, the percentage of parasitism (1.46) was very low.

Before pupating, the larva (Plate 147, Fig. 2) apparently has a short prepupal period; when the pupa is fully formed the larval skin is cast off over the anal end of the pupa.

The pupa (Plate 147, Fig. 3) is fairly mobile on account of the ready movement of the abdominal segments and the ring of chitinous spines arranged around each segment. This habit may be exercised in nature to enable the pupa when nearly mature to approach close to the surface in the rotten mushy material for the readier emergence of the adult. (Plate 147, Fig. 4.)

The following is a brief description of the life-cycle stages of this species:—

Egg.—Pearly white; length 1.5 mm.; breadth .5 mm.

Larva.—Creamy white in colour; length about 30 mm.; width 3 mm. The most distinguishing feature of the larva is the elongation of the terminal anal segment of the body into four fleshy triangular-shaped lobes.

Pupa.—Reddish brown in colour; length about 25 mm.; breadth about 6 mm. Around anal segment are six spines, two ventral and other four more dorsal; around each segment is a row of small spines.

Adult.—Of a general brown colour with the tip of the abdomen much darker; the wings are well developed and are yellowish brown in colour and with one dark spot on the costal margin towards the apex. The sexes are readily distinguished by the shape of the abdomen, the males being much narrower in proportion to their length than the females.

Length of fly about 20 mm., width about 5 mm. over thorax, wing expanse about 40 mm.

It should be stated that in the notes made on the borers and the predators referred to, the observations can only be regarded as fragmentary on account of the limitation in time rendering impossible a complete study of the insects concerned; such would require at least many months of intensive study, both in the laboratory and in the field.

Pests Recorded from the Banana Plant or Fruit other than Weevil Borer.

The worst pest of the banana fruit in Java is the caterpillar of the fruit moth (*Notarcha octosema* Meyr.). This is present throughout the island and causes more or less severe blemishing of the fruit on practically every bunch. Experiments have been carried out for its control by blowing Pyrethrum powder up under the flower bracts of the young bunches, but owing to the very tall nature of the plants of many of their banana varieties, this is slow and costly. In reference to results from this treatment I was informed that, although promising, the trials would have to be repeated before any definite conclusions could be drawn.

Scirtothrips signipennis (Bagnall) was collected on the stems and bunches at Buitenzorg, and *Thrips partirufus* Gir. was taken in bud ends at Bandeong and Buitenzorg. With more extensive collecting it is probable that both species would be found to have a general distribution through Java.

“Rust” (Thrips damage) was observed on a good deal of the banana fruit in Java, but was generally not severe. This is possibly largely due to the open nature of the hands of a large number of the varieties.

Erionata thrax (Hesperidae) is fairly common, the larvæ rolling up sections of the leaf, inside which they develop.

The following insects were also recorded as banana foliage feeders:—

Hispidae.—*Gonophora riffa* (surface order), *Botryonopa sanguinea* Cuen (eats holes in leaves).

Scarabæidae.—*Adoretus* sp., *Exopholis hypoleuca* Wlk.

Lepidoptera.—*Drapetodes mitaria* Gn., *Euproctis virguncula* Wlk., *Prodenia litura* F., *Ypilosoma strigtula* Wlk., *Mahasena hoching* Moore.

PART II.

Introduction.

In the general systems of insect pest control a great deal of attention is being paid to biological lines of attack and also to improved agricultural practice.

In crops such as tea, sugar, or coffee for example, the areas under crop are so large and the difficulty of proper supervision of native labour carrying out any treatment is so great that any chemical measures of attack on the problems are largely impracticable. This is not to say that such lines of investigation are not being tested out, for such is not the case; but it was evident that such measures could not be utilised on a large scale in many cases, at least, under existing conditions.

Owing to the very close attention that had to be paid to the main problem of the study of the position regarding the banana weevil borer and the search for parasites and predators, the amount of time available for following the other lines mentioned in my commission was very limited. As far as time permitted I visited the various Proefstations and met their technical workers, who were always most willing to show and explain their work to me; unfortunately the time that could be devoted to this work was all too limited.

The information given on the general crops was obtained largely by conversations with the different workers and also partly from the literature published on these subjects.

SUGAR-CANE.

The principal recorded pests of sugar-cane in Java are the stemborer, *Diatraea striatalis* Sn., the topborer, *Scirpophaga intacta* Sn., and the “White Louse,” *Oregma lanigera* Zehnt. Of the last mentioned, a considerable amount of work has recently been done on the parasite of this species, *Encarsia flavo-scutellum* Zehnt.

Scarabæid larvæ are only bad in some fields, and these are usually poor soils; so far no measures have been attempted for their control. The worst species is *Holotrichia helleri* Brsk., which is a bad pest among many lowland crops; investigations have, however, only been recently begun into its life history, &c. Two species of Scoliid parasites, *Diclis*

thoracica Fab. and *Diels annulata* Fab., are recorded on *H. helleri* (vide Bull. No. 13, 1915 Laboratorium voor Plantenziekten, De Cassava—Oerets, S. Leefmans).

From inquiries made from Dr. Hazelhoff, Paserooan, and Dr. van der Goot, Buitenzorg, *Rhabdocnemis obscura* is apparently not known in Java.

It is possible that under certain conditions *Plæsius javanus* may, in Queensland, act as a predator on this Curculionid and may also act as a predator on Scarabæid larvæ in the soil. The Leptid, if it can be established in Queensland, may also act as a predator on *R. obscura*.

TEA.

There are a number of insect pests recorded from the tea plant; these are dealt with in Bull. IX. 1925, Mededeelingen van het Gouvernements Kina-Proefstation.

The tea Capsid (*Helopeltis antonii* Sign.) is the most serious pest of tea in Java. Dr. Menzel, the Entomologist to the Proefstation, has been devoting a considerable amount of study to the Braconid (*Euphorus helopeltidis* Ferriere), a parasite of the larva of this species. This Braconid is attacked by an Ichneumonid hyperparasite (*Stictopisthus javensis* Ferriere), thus rendering special precautions necessary in the field liberations of the parasite.

Investigations are also being made along the lines of improved agricultural practice to stimulate the growth of the plants.

H. antonii Sign. is reported to be worse in the region of Soekaboemi than in the Preanger area (Bandeong, &c.).

COFFEE.

The worst insect pest of coffee is the berry borer (*Stephanoderes hampei* Ferr.). Hand picking of affected berries before the insects have reached full development and the use of parasites are the two lines of attack that are being worked on for the control of this pest.

The twig borer, *Xylchorus coffea*, also at times causes appreciable damage.

In the attempted control of the berry borer a considerable amount of work has been done with parasites imported from Uganda.

In the liberation of these parasites a node of the giant bamboo was taken and an auger hole bored through it in about the middle of the section. The parasited material was placed inside and the opening sealed with fine copper gauze. These containers were found to be very satisfactory for field use.

CASSAVA.

The main pest of cassava is the mite, *Tetranychus bimaculatus* Harv., which attacks the foliage. This does not, however, appear to seriously affect the growth of the plant.

There are a number of species of Scarabæid larvæ recorded as feeding on undersurface portions of the cassava plant. These are *Leucopholis torida* Fabr., *Lepidiota stigma* Fabr., *Euchloria viridis* Roufr., *E. nigra*

Fab., and *E. pulchripes* Lansb., *Anomala obselata* Blanch., *A. anchoralis* Lansb., *A. aceræ* Perty ?, *Brahmina pumila* Sharp., *Lepadoretus compressus* Web., *Adoretus sciurinus* Burmeister, *Holotrichia helleri* Brsk., *H. leucophthalma* Wied., *Popillia biguttata* Wied., and *Serica* sp.

The Scoliid parasites recorded from these are *Dielis annulata* Fab., *D. luctuosa* Smith, *D. tristis* Sauss., *D. javana* Lep., *D. thoracica* Fab., *D. formosa* Guérin, *Triscolia rubiginosa* Fab., a species of *Tiphia*, and unknown species of *Dielis*.

MAIZE.

The leaf fungus (or lyer disease) *Sclerospora javanica* Palm. is the worst trouble experienced with maize in Java. *Heliothis obsoleta* occurs, but is not, so I was informed, a really serious pest of maize in Java. In a number of the islands of the outer possessions *Pyrausta salientialis* Snell is a serious pest of this crop, feeding in the upper portion of the stem, causing the death of the stalk, but it is not, so far, known to occur in Java.

FRUIT PESTS.

Citrus is subject to attack by several species of scale insects (Coccidæ), while fruit flies (Trypetidæ) also have caused considerable damage to the crops.

The following species of Trypetidæ are recorded from Java:—

Ceratitis capitata Wied., *Rioxa musæ* Froggatt—on citrus.

Bactrocera curcurbitæ Coq.—on melons, &c.

Bactrocera ferruginea Fabr.—on mango, *Capsicum annuum*.

Bactrocera caudata Fabr.

Dacus garcinia Bezzi.—on *Garcinia dulcis*.

Dacus umbrosus T.—in large fruit such as the “Jack Fruit” (*Artocarpus integrifolia*).

A good deal of success was reported against *C. capitata* by the use of poison syrup baits hung in the trees. The baits comprised sodium arsenite, lemon juice, molasses, and a little sugar.

Citrus is subject also to “Collar Rot,” special investigations into which are now being undertaken in the Citrus Experimental Garden out from Malang.

In conclusion, I wish to express my indebtedness to Dr. Barnard, Director of the Department of Agriculture and Commerce, Dr. den Berger, Director of Agriculture, Dr. van der Goot, Acting Director, and Dr. van Karlshoven, Institut voor Plantenziekten, and Heer Oehse, Department Land bouw Buitenzorg, for their ready assistance to me in obtaining information and furthering the objects of my mission in every way possible, and to the Landbouw Consultants, Heer Koorenhof at Bandeong, Götz van der Vet at Solo, and Dr. Loos at Bandowosa, and Heer Woolf at Garoet, the Tuinbouw Consulents, Heer de Vries at Malang, for their assistance in showing me round their districts, and for the information so readily given, and to Dr. Hazelboff, Dr. Mensel, and the other technical workers for their courtesy in showing and so fully explaining their work to me.

Flag Smut of Wheat.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Serious loss to wheat from disease is fortunately not of frequent occurrence in Queensland. During the past season, however, a malady commonly known as Flag Smut has been found to be present which may account for considerable reduction in yield if precautions are not taken to minimise this loss. Flag Smut is a fungus disease caused by the organism known scientifically as *Urocystis tritici*. Although this disease has been present in Australia since 1868, there have previously been only two isolated records of its occurrence in this State, in the years 1906 and 1915.



PLATE 148.

A field survey made by officers of the Agricultural Branch since the first discovery of Flat Smut this season has shown the disease to be fairly widely distributed throughout the chief wheatgrowing districts. It is probable that in some of the affected areas the disease was present the previous season, if not earlier, but not in sufficient quantity to come under notice.

In most crops examined the number of affected plants was small, and the loss would be slight; but in some fields, which may have borne infected crops the previous season, a loss of up to 20 per cent. had occurred. In Southern States, loss from Flag Smut is reported to vary from 5 to 70 per cent. of the crop.

In order that growers may recognise Flag Smut, and take what precautionary measures are possible for overcoming this disease, a description of the characteristic symptoms and a summary of the principal control measures are given below.

Symptoms.

The first definite symptoms of Flag Smut appear as narrow greyish lines running up the leaf parallel with the veins. The lines are continuous or more or less interrupted. The streaking may be so closely



PLATE 149.

formed as to give a characteristic leaden colour to the whole leaf. (Plate 150, Fig. B.) The region of the grey streaks is usually slightly raised above the general level of the leaf, and in later stages may sometimes become ruptured along its length to expose a black sooty mass of fungus spores.

The presence of the fungus within its tissue usually stimulates the wheat plant to abnormal growth, with the result that the flag becomes twisted and wound about itself in a very characteristic manner. (Plate 151.)

A plant affected with Flag Smut remains stunted and deformed, and is usually unable to develop ears. In some cases it may be found that one or two stalks of a stool have produced normal ears, while the

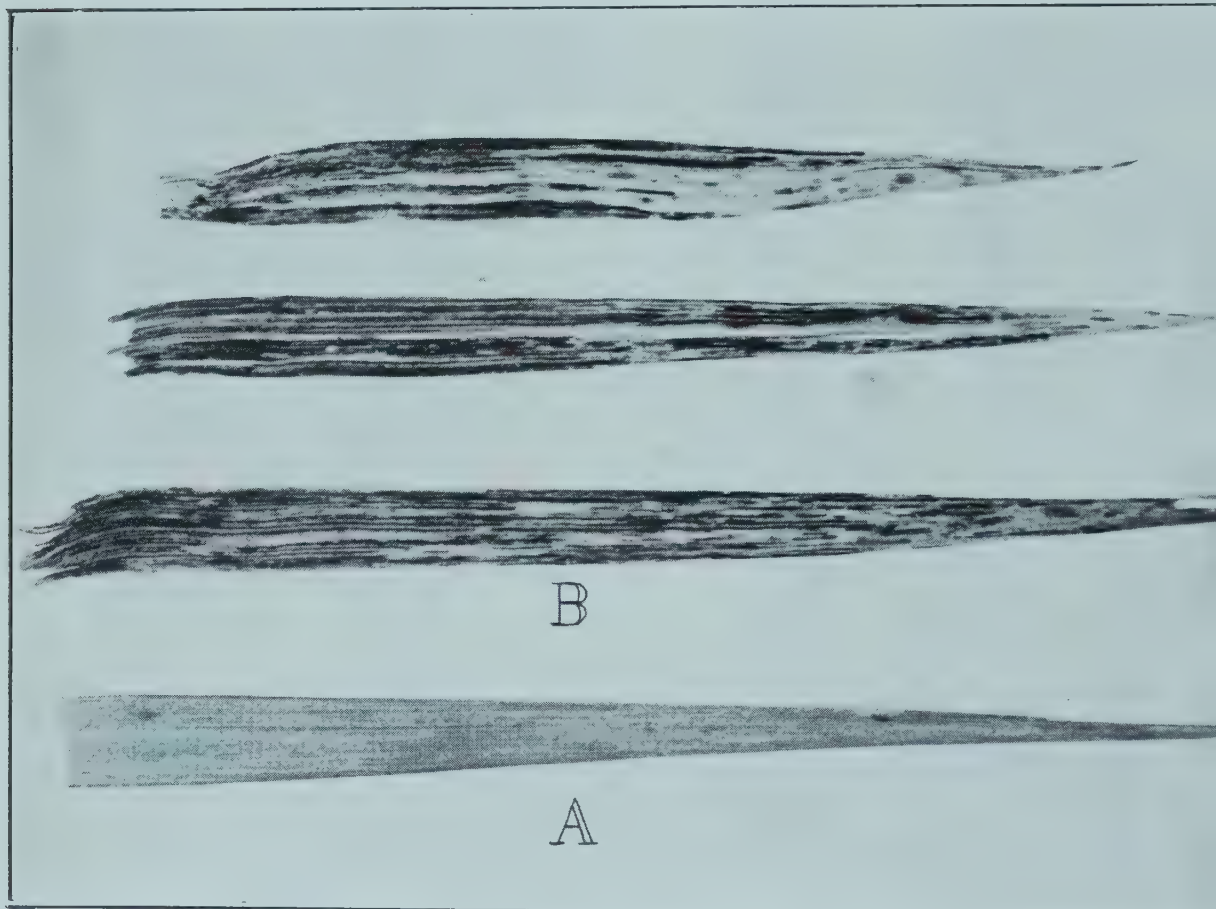


PLATE 150.

rest exhibit the stunted, diseased condition. Sometimes an empty and malformed head may be seen caught up in the twisted flag, or it may be free from this, but bearing, if any, only shrivelled grain.

The small, stunted or abnormal plants are not particularly conspicuous, and for this reason Flag Smut often may not be given its due place as a factor in producing a light yield. The quality of the grain that is actually harvested from a crop in which Flag Smut occurs is unaffected by the presence of the disease.

Cause.

Flag Smut is caused by a fungus (*Urocystis tritici*) allied to those other fungi responsible for smut diseases, such as, for example, Bunt and Loose Smut. This organism can readily be distinguished from the causal



fungus of the other wheat smuts by the characteristic appearance of its spores. These are minute rounded to oval dark brown bodies, and are surrounded by a layer of sterile bladder-like cells which are not found in connection with the spores of either Bunt and Loose Smut. (Plate 148.) It is these dark spores present in enormous numbers which produce the leaden-coloured streaks in an infected flag. They may lie singly, but are more commonly associated two to four together to form a cluster known as a spore ball.

During the ordinary routine of harvesting and cultivation the spores are liberated into the soil, or may contaminate the seed in the harvesting and threshing machinery. These spores when conditions are suitable will germinate by putting forth a short filament which typically branches to form two or three secondary spores. (Plate 148.) These sporidia, as they are called, may then produce a delicate thread-like germ tube which is able to penetrate the wheat plant when this is in the tender condition of the germination period before the shoots are above ground. The delicate colourless threads of the fungus then grow up through the tissue of the plant as this develops, and finally at the points represented by the grey lines develop from its branches the innumerable dark-brown spores mentioned above.

Control.

A consideration of the life history of the Flag Smut fungus has shown that the wheat plant may be infected by spores which are contaminating the seed or by those already in the field, which have been derived from portions of flag-smutted plants left from a previous crop, or which have been introduced mechanically by the wind or on the person of men and animals. Seed contamination is the least serious, as the danger of Flag Smut arising by this means may be largely overcome by the ordinary methods of seed treatment. To free the land from infectious material is a rather more difficult undertaking, and to do so without causing some inconvenience is hardly possible. The following recommendations are designed to minimise the loss from Flag Smut:—

(1) Treat the seed with fungicides as for the control of Bunt. This procedure is imperative if the fields to be planted are still clean. If the field is badly contaminated with diseased material from a previous crop full benefit may not be obtained from the seed treatment—though this is still desirable—as infection may take place from spores in the soil. The standard methods of pickling can be followed.

For dry pickling, copper carbonate is used at the rate of 2 oz. to the bushel. This is applied by revolving the seed with the powder for several minutes in a box or other container in order to ensure thorough and intimate mixing so that each individual grain is completely enveloped in the fine dust. Where a gravity pickling machine is used the grain should be passed through at least twice. The less effective method of turning the seed over on the floor should be avoided. The dry process has the advantage in that germination is not impaired and the seed may be treated some time prior to planting.

The wet method consists of immersing the seed for two or three minutes in a solution of bluestone made up at the rate of $1\frac{1}{2}$ lb. to 10 gallons of water. The seed is stirred in order that thorough wetting may take place and any bunt balls may rise to the surface and be

skimmed off. Only wooden or copper vessels can be used to contain bluestone solutions as this chemical will eat through iron. A somewhat inferior method sometimes employed consists in sprinkling the seed with the solution and turning it over until all the grains are thoroughly wetted. After treatment the seed is dried and then sown as soon as possible. If germination is delayed some injury to the grain may result from the use of bluestone, and when the seed is to be sown in a dry seed-bed it may be advisable, after treatment with the bluestone, to dip it for a minute or two in lime water prepared by dissolving 1 lb. of burnt lime in 10 gallons of water by which means the chance of reduction in germination is minimised.

(2) Whenever possible burn all stubble and straw as soon as harvesting is completed, as by so doing a large proportion of the spore-bearing material may be destroyed. Then fallow the land since the working of it will help to induce spore germination leading to death of the fungus in the absence of its host plant.

(3) A field that has borne an infected crop should be rotated for two years to crops other than wheat in order that the fungus may have time to die out of the soil. As the organism causing flag smut can infect wheat only, any other crop may be planted during this interval. The more cultivation the field receives during this time the better.

It is a wise plan to practise a certain amount of rotation even in fields in which Flag Smut has not been observed, since a slight infection may often occur which is easily missed during casual inspections. This may lead to successively heavier infections if wheat follows wheat every year.

(4) Avoid feeding stock on diseased hay and stubble as the spores of the fungus are able to pass through the animal uninjured and thus the disease becomes further distributed in the manure. Mechanical distribution on the feet of field workers and animals is always liable to occur and should be avoided as far as possible. Harvesting of badly affected fields should not take place during windy weather. Harvesting machinery after being used in a diseased field should be cleaned as thoroughly as possible before being taken into an uninfected field.

(5) Plant in a moist well-cultivated seed-bed as the chances are that many of the spores will by then have germinated and died. Avoid planting in a dry seed-bed, as spores and wheat then tend to germinate at the same time and infection is likely to result.

(6) Varieties of wheat differ in their relative susceptibility to Flag Smut. In an infected district it is therefore advisable to avoid planting varieties subject to the disease. Little definite information is available at present so far as Queensland is concerned, but it would appear that "Canberra" is definitely susceptible here as in other States, and the use of this variety wherever Flag Smut is prevalent should be discontinued.*

Other Wheat Smuts.

It has been found that there is a certain confusion in the minds of some growers regarding the identity of the different smuts affecting wheat. Typical illustrations of Bunt and Loose Smut are therefore given in Plate 149 for comparison with Flag Smut.

* It is hoped next season to conduct a test of the relative susceptibility of all the varieties commonly grown in Queensland.

Bunt or Stinking Smut shows up in the mature ear when in place of the normal grain there is formed merely a shell filled with a black evil-smelling mass of fungus spores (Plate 149, Fig. B). This compact mass of spores is known as a bunt ball. When these are crushed so as to liberate the spores on to seed wheat, infection of the germinated seedling may take place as in the case of Flag Smut. Bunt may be readily controlled by the seed treatment mentioned above, since contaminated soil is not the frequent source of infection as it is in the smut disease just described.

Loose or Flying Smut, like Bunt, affects the ear, but in this case shows up at flowering time. The fungus forms a sooty mass of spores in the ovary and other floral organs and no grain is formed (Plate 149, Fig. A). The spores are readily blown away by the wind, and if they should lodge on a healthy flower head they are liable to germinate there and penetrate the developing ovary. The fungus then remains within the grain in a dormant condition until the seed is planted, when it commences to grow up within the developing wheat plant and finally forms its spores in the flower head.

Since the fungus is present, well protected within the tissues of the grain, the seed treatment used for Bunt and Flag Smut is ineffective in the case of Loose Smut. To reduce the loss from the latter disease it is therefore necessary to obtain seed from a crop in which Loose Smut is not present, or else use a hot water treatment in which the temperature is such that the fungus is killed but the wheat itself remains uninjured. This latter procedure is, however, somewhat troublesome for the average grower to adopt. Jensen's modified hot water treatment consists in presoaking the seed for about five hours in tepid water, when it is then immersed for ten minutes in hot water held at 129 deg. Fahr. (54 deg. C.). The temperature of the water during this process should not vary above 131 deg. Fahr. or below 124 deg. Fahr., but should be kept as near as possible to 129 deg. Fahr. by the addition of hot or cold water. At the upper limit the grain may be injured while at the lower the fungus is not killed.

CONTROL OF FLAG SMUT IN WHEAT.

Flag Smut is caused by a fungus which attacks the wheat plant at the time of germination and then grows through the tissue as the plant develops, causing a deformity and stunting of the flag, so that a normal ear rarely develops. A diseased plant may be readily picked out by the appearance of the flag, which is variously contorted by twisting about itself, and exhibits streaks of a grey or leaden colour running up its length. These streaks are due to the production of innumerable fungus spores within the tissue.

The Minister for Agriculture expressed concern at the prevalence of this disease in the wheat crops harvested on the Darling Downs this season. The situation called for immediate action on the part of the growers concerned, and to assist them the Minister made available the following recommendations for the control of this serious disease. These recommendations have been drawn up by the Plant Pathologist of the Department (Mr. Simmonds) and are those generally believed to be effective for the control of this disease provided they are enthusiastically adopted by the growers as a whole. The Minister, however, stressed the necessity for enthusiastic action on the part of the growers, for the success of any campaign rests very largely in their hands.

The following measures should be adopted by growers whose farms are at present free from infection:—

- (1) Obtain seed from a district where flag smut is not known to exist, and as an additional precautionary measure treat the seed with a fungicide as for Bunt.
- (2) Practise a rotation to other crops after wheat for at least one year in order to give a better chance for the fungus to die out of the soil should an infection have occurred too slight to be noticed.

Where infection has already been established the action to be taken is as follows:—

- (1) Burn all stubble and straw as soon as possible after harvesting is completed, and then fallow the land as the working of it will help to induce spore germination, leading to death of the fungus as no suitable host is available.
- (2) Avoid feeding stock on diseased hay or stubble, as the spores may pass through the animal uninjured and thus become further distributed in the manure. Mechanical distribution on the feet, &c., of field workers and animals is always liable to occur, and should be avoided as far as possible.
- (3) Rotate an infected field for two years to crops other than wheat. The more cultivation the field receives during this period the better.
- (4) Disinfect all seed used with the copper carbonate or bluestone and lime treatment, as recommended for the control of Bunt.
- (5) Plant late and in a moist seed bed as the chances are that many spores will by then have germinated and died out. Avoid planting in a dry-seed bed, as spores and wheat then germinate at the same time and infection is likely to result.
- (6) Distribution of flag smut by use of harvesting machinery which has previously been used on a diseased crop is a danger which should be avoided as far as possible.

Certain varieties of wheat have shown decided susceptibility to flag smut in other States of the Commonwealth. Should some of the Queensland grown varieties be proved susceptible to this disease, their use in districts where flag smut is prevalent should be avoided.

A NEW I.M.S. CHAMPION.

“Evelyn of Sunnyview,” 9412, Vol. 2 I.M.S., has gained the title of Australian I.M.S. champion junior two-year-old.

She commenced her test at two years and three and a-quarter months of age and produced 10,429.68 lb. of milk containing 567.624 lb. of fat in 273 days, exceeding the record made by “Gentle 6th of Greyleigh,” the former champion, by 76.06 lb. of fat.

That “Evelyn” combines the type and character of her breed is evidenced by her successful career in the show rings, securing her first blue when barely seven months old in the class for heifers under twelve months. This success was followed up by gaining blues at Kingaroy, Murgon, Kilkivan, Maryborough, Gin Gin, Bundaberg, Rockhampton, and Gympie, and fourth in Brisbane Royal, in class under twelve months.

In class one year and under two years she continued her success by winning blues at Kingaroy, Wondai, Murgon, Maryborough, Childers, and second at Gin Gin, Bundaberg, and Gympie. She also gained champion honours at two and reserve champion at three shows.

In class sire and progeny she was one of a group that was placed first twelve times, and in class for pen of dairy heifers was placed first nine times.

Show ring honours were added to by her securing four first prizes in milking competitions.

The new champion is by “Diamond of Greyleigh” 297, I.M.S., who is a grandson of “Fussy’s Pride of Hillview,” 302, I.D.C., N.S.W., being by “Foch of Greyleigh,” 33, I.M.S.H.B.

Her dam is “Snowdrop of Sunnyview,” 4219, I.M.S.H.B., by “Young Victor.”

“Evelyn” was bred by and is the property of Mr. Joseph Phillips, Sunnyview, I.M.S. Stud Farm, Wondai.

LESSONS ON POULTRY FOR JUVENILE CLUBS.

These lessons, which will be issued in three sections, have been designed to meet the requirements of Juvenile Poultry Clubs.

Section 1 has been prepared with the object of covering the first section of Juvenile Club work, which embraces the care of pullets.

Section 2 will deal with the care of laying stock, which is the second phase of Club work.

Section 3 will embrace breeding, the third and final stage of Juvenile Club work.

The scheme of Poultry Club organisation provides for Juvenile, Senior, and Adult Clubs.

A further series will be prepared for Senior and Adult Club work.

Lesson I.

HOUSING.

To obtain the best results from poultry, good housing is as necessary as good stock, good feeding, and good management.

Essentials.—Correct ventilation, freedom from draughts, freedom from moisture; sufficient room for the comfort of the birds.

Design.—Poultry houses may be built of a variety of shapes, but they should always be open-fronted. They should be constructed so that a space of 3 inches is left between the top of the back wall and roof, to provide for ventilation.

In building a new house the following photograph should be closely followed in design.

Site.—Poultry houses should be built on well-drained land. Positions with gentle slopes to the north and north-east are ideal. Wet and damp houses are cold and unhealthy.

Material.—Timber, free from cracks and crevices, and galvanised iron are most suited for building poultry houses. The walls may be made of galvanised corrugated iron, kerosene tins, timber, or sacks whitewashed. The roof should always be iron and, as cracks and crevices harbour vermin, iron is most suitable for the whole structure.

Size.—Where a netted run is attached to a poultry house, 2 square feet of floor space per bird should be allowed. As Club members only have a few birds, large buildings are not necessary.

A house 4 feet by 4 feet will accommodate six hens and a rooster. The house should be 4 feet high at back and 4 feet 6 inches high in front.

A lower roof would make the house too hot and more difficult to clean out.

The NEW McCORMICK-DEERING Ball-Bearing Cream Separator

*Ball-Bearings
at all
High-Speed
Points*



*Capacities:
35 to 150
gallons of milk
per hour*

*Hand, Belted,
or Electric*

MADE in six sizes, the new McCormick-Deering Ball-Bearing Cream Separator is suitable for herds of all sizes—"for one cow or a hundred." Every one of the six sizes is equipped with high-grade ball bearings at all high-speed points. The machine is so easy to turn that its operation is a matter of the utmost simplicity.

In addition, there is a bowl of skilful design with a skim-milk regulating screw controlling the cream density—a distinct advantage over the old method of adjustment. There is also an efficient splash system of lubrication which lubricates every moving part from the start.

The new McCormick-Deering Ball-Bearing Cream Separator has a pleasing appearance—and, what is more, it retains its appearance. That is because it is japanned by a high-temperature and long-baking process which provides one of the most durable metal finishes known.

The new McCormick-Deering Ball-Bearing Cream Separator represents the last word in cream separator design and construction. Its beauty, its easy turning and its close skimming all combine to make it a machine of outstanding merit—a machine which you should investigate without delay. Ask the McCormick-Deering local agent about it.

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Construction.—Houses should be built to face north or north-east, to protect from rain and wind, and to admit the sun's rays during winter. Greater protection from rain is given by projecting the roof in front or by building a small veranda.

The walls should be solid to prevent draughts. Where slabs are used for walls, the interstices should be covered by laths.



PLATE 152.

Quantities.—The iron and timber required for building a house as per plan is as follows:—

3 in. by 2 in. hardwood for corner posts—Two 5 ft. 6 in., two 6 ft.

3 in. by 1½ in. pine battens for roof, back, and ends—Six 4 ft., two 5 ft. 6 in.

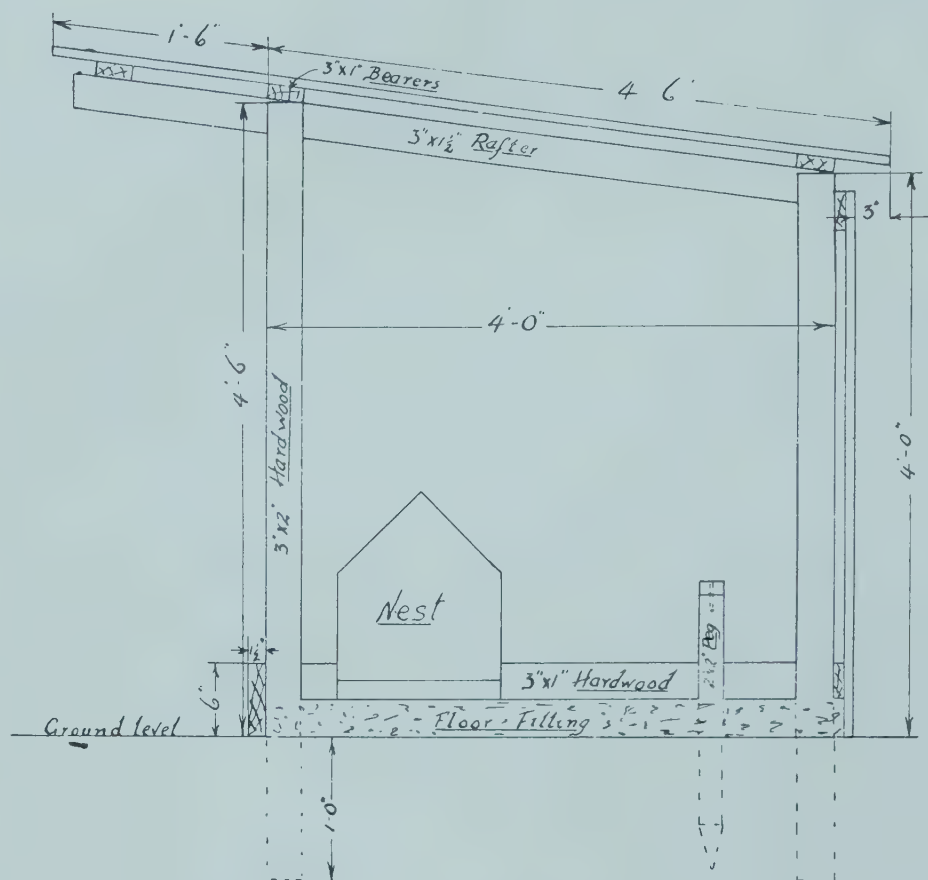
6 in. by 1 in. hardwood for front of house—One 4 ft.

Iron.—Roof, two 6 ft.; back, one 8 ft.; ends, two 9 ft.

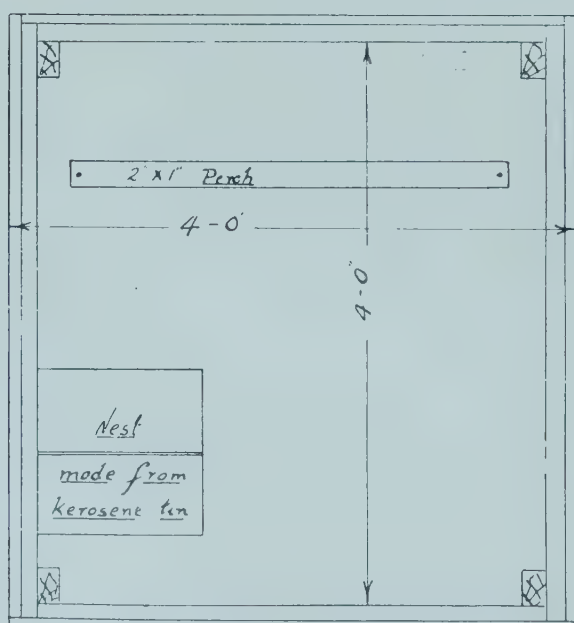
This material would cost about £2. Second-hand iron would reduce this expenditure.

Floor.—The floor of the house must be dry and hard, to have good sanitary conditions. Concrete floors are most desirable. Good hard floors can be made by using ant bed, well wetted and tamped. In order to ensure dry floors, raise them above the level of surrounding land.

Fittings.—In a house, perches and nests are necessary. The perches should be set up on pegs and made movable, as shown in plan. They should be erected 10 in. to 1 ft. from the back wall, and about 10 in. high. The nests should be placed in a shaded convenient position of the poultry house prior to the birds commencing to lay.



— Section —



— Ground Plan —

Drawn by F.B. 6.1.28

Netted Runs.—Fences should be 6 ft. high and posts 12 ft. apart. The bottom of the netting should be buried to a depth of 6 in. or well pegged down. The size of the run depends upon the numbers kept in any one flock. Always endeavour to have it large enough to prevent the roots of grass being eaten out. Where this is impossible, have two runs so that one may be dug over and planted with some gross feeder, such as rape.

Lesson II.

THE REARING AND FEEDING OF PULLETS.

CARE ON ARRIVAL.

When club members receive their stock they will be about eight weeks of age, weaned from the brooder, and will have learnt to perch. Young stock do not take kindly to changes, and the habit of perching is often forgotten when the birds are shifted to new quarters.



PLATE 154.

An illustration of how to bed chickens down, the straw being well banked up in corners.

Young stock that are not perching and have no brooder generally crowd into corners, with the result that some are smothered. Until the habit of perching is again acquired, place a good layer of dry straw on the floor, banking it well into the corners, for a bedding. Fork the straw over daily, shaking the droppings off the top and loosening the bedding for the birds to nestle in.

FACTORS AFFECTING GROWTH.

Ample range, feeding, clean water, cleanliness, separation of sexes, and vermin.

Range.—Stock on unrestricted range obtain large quantities of insect life, thus reducing cost of feeding. They consume freely of the tender shoots of grass. They have plenty of exercise, which assists in development. On free range, as a rule, good shade is available, and the land on which they run is not so foul as when they are penned.

Feeds.—All feeds contain moisture, ash, protein, fat, carbohydrates, and fibre in varying quantities. The body of the fowl contains similar substances in more definite proportions. In feeding it is essential to supply these substances in the quantities necessary to obtain good development.

Use of Food.—The food consumed by all growing animals is used—

- 1. To build up flesh.
- 2. To supply heat and energy.
- 3. To build up bone.

Proteins.—Proteins are organic compounds of carbon, hydrogen, oxygen, nitrogen, and sulphur.

Carbohydrates.—Carbohydrates are compounds of carbon, hydrogen, and oxygen.

Protein.—This substance is essential for the growth of flesh. Skim milk, lean meat, and insect life are rich in protein.

Carbohydrates and Fats.—These substances supply the heat and energy of the birds. One part of fat is equal to 2¼ parts of carbohydrates. Maize is rich in fat and carbohydrates.

Ash.—Among the ash from any food burnt is the mineral matter necessary for bone development. Foods rich in ash are skim milk, lucerne, and bonemeal.

COMPOSITION OF SOME POULTRY FOODS.
DIGESTIBLE NUTRIENTS.

Food.					True Protein.	Fat.	Carbo- hydrates.	Fibre.	Nutritive Ratio 1.:
Maize	..	..	..	..	6·2	3·5	65·8	1·8	12·1
Wheat	..	..	..	..	9·5	1·3	62·2	1·1	6·9
Kaffir corn	..	..	..	..	6·8	0·9	56·2	0·8	8·7
Bran	..	..	..	..	11·6	1·8	40·5	3·3	4·1
Pollard	..	..	..	..	11·9	3·1	54·0	2·1	5·3
Lucerne chaff	..	..	..		10·3	0·7	27·7	8·4	3·6
Milk (skim)	..	..	..	..	3·6	0·1	4·9	..	1·4
Buttermilk (powder)		..	..		32·5	1·1	49·1	..	1·6
Meat meal	..	..	..	..	42·0	7·0	4·5	..	0·5

The above table shows a great variation in constituents of different foods.

Feeding.—Experience teaches that about one part of protein is required to every four parts of carbohydrates and fats to obtain good development in poultry; that is, a nutritive ratio of 1 to 4 is required.

Maize has a nutritive ratio of 1 to 12, and if this grain is the only food given to poultry they will not make sufficient muscular development or good bone development.

One pound of maize fed in conjunction with 4 lb. of skim milk would give a nutritive ratio of 1 to 4.6. This food in addition to insect life would make a good ration.

Nutritive Ratio.—The nutritive value of a ration is ascertained by multiplying the fat content by 2.25, adding to the result the carbohydrate and fibre content, and dividing by the amount of protein.

Example—	Protein.	Fat.	Carbo- hydrates.	Fibre.
1 lb. Maize contains .. .. .	.062	.035	.658	.018
4 lb. Skim milk .. .. .	.144	.004	.196	..
	.206	.039	.854	.018

$$\text{Fats } .039 \times 2.25 = .087$$

$$\text{Carbohydrates} = .854$$

$$\text{Fibre} \quad .. = .018$$

$$.959$$

$$\text{Ratio of Protein to Carbohydrates} = .206 : .959$$

$$\text{or} = 1 : 4.6$$

Quantities.—With correct feeding there is no danger of giving birds too great a quantity. It is possible to make a ration of any desired ratio with one or two foods. A variety of foods should, however, be used in order to increase the palatability of a ration. The more palatable a ration is, the greater the consumption will be. If the ration is correct, increased consumption will lead to increased development.

Mash.—Mash is a term applied to a mixture of ground foods fed either in a wet or dry state. A suitable mixture for pullets under twelve weeks of age is 8 lb. bran, 12 lb. pollard, 1 lb. powdered buttermilk, 1 lb. bonemeal, and 2 oz. of fine salt.

From the age of 12 weeks to the laying stage the buttermilk may be replaced with meat meal and 3 lb. of lucerne meal added to the above quantities.

Skim Milk.—If ample supplies of skim milk are available, there will be no need to add powdered milk or meat meal to the ration.

Feeding Mash.—All mash foods must be fed in suitable receptacles. When wet mash is fed, it should be made crumbly (not sticky) and placed in dishes. In feeding wet mash, only quantities that will be consumed in half an hour should be given at one time.

When mash is fed in a dry state it is placed in hoppers and is constantly before the birds. The practice of dry-mash feeding ensures that the birds are receiving all they require.

Feeding Grain.—Grains are better fed during the evening at a fairly regular hour, say 4 to 4.30 p.m. The feeding of grain at this hour enables the birds to obtain a full supply of food of a slow digesting nature.

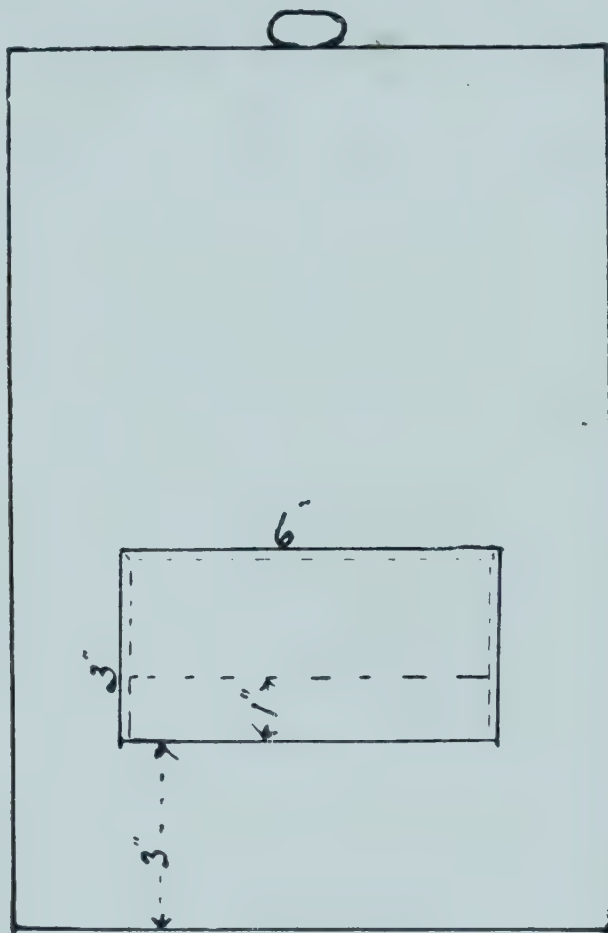


PLATE 155.—DRY-MASH FEEDER.

A simple method of making a dry-mash feeding-vessel for a few growing pullets from a kerosene tin is to cut a hole 6 in. x 3 in. in one side, as shown in the sketch. All cuts to be made on dotted lines and the edges turned to prevent injuring the bird. That portion below the bottom dotted line to be rolled inside to prevent the food being scratched out. For matured stock a larger hole would be necessary.

Variety is desirable in the grain fed to poultry. A mixture could be made of cracked maize, wheat, and hulled oats. Hulled oats are fairly expensive, and in places unobtainable. Feterita and cracked maize could be extensively used and probably grown by club members.

Green Feed.—Green feed is rich in mineral salts. It assists in maintaining stock in good health, and supplies mineral matter. Use only young succulent growths for fowls. Rape, lucerne, barley, cabbage, lettuce, &c., all make suitable green foods.

Grit.—Grit is absolutely necessary for birds at all times, and particularly so when confined. It assists in supplying mineral matter and also is used in the gizzard for the purpose of food mastication.

Drinking Water.—Fowls drink frequently and use a good quantity of water throughout the day. In drinking, they immerse the beak and

soon dirty the water. The water should be renewed at least daily, and kept in a cool shaded position.

Drinking vessels for very young stock should be constructed so that there is no possibility of their being drowned.

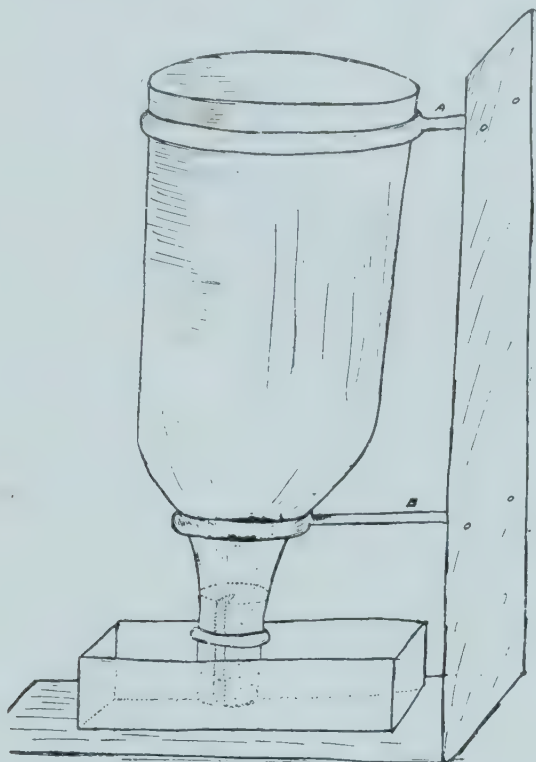


PLATE 156.—ROUGH SKETCH OF INVERTED BOTTLE AND TIN FOR WATER SUPPLY TO YOUNG CHICKENS.

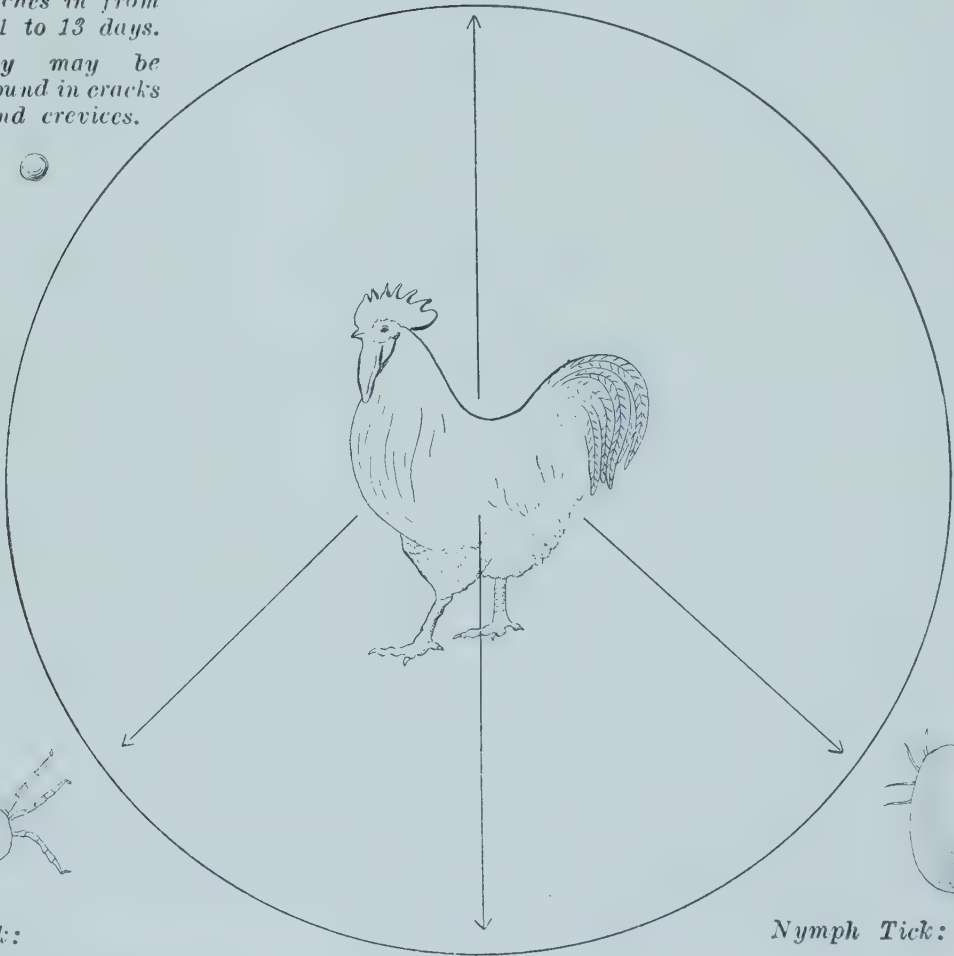
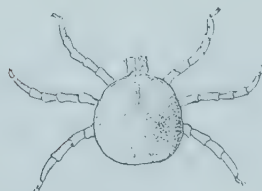
The bottle is supported by means of two hoops of wire or hoop iron at A and B to a piece of light pine. The upright is nailed to a foot on which rests a shallow tin where the chickens can drink. A sardine or tobacco tin serves well. A cork, having a V piece removed its entire length allows, when the water in the tin has fallen below the level of the mouth of the bottle, the entrance of air thereby replenishing the water supply.

Exercise.—Exercise is necessary for good development. When birds are confined to a small yard, litter such as straw, grass, leaves, &c., should be strewn on the ground for them to scratch among. To induce exercise, grain should be fed in this litter.

Cleanliness.—Cleanliness is a most important feature. Houses should be cleaned out weekly to prevent the atmosphere becoming objectionable. Weekly cleaning will assist in checking vermin infestation. Weekly cleaning, if thoroughly done, will indicate the presence of many varieties of vermin when, if prompt action is taken for their eradication, they will cause little ill effects.

The water vessels should be cleansed daily, as they are a source by which disease is easily transmitted from bird to bird.

Separation of Sexes.—As early as it is possible to distinguish males from females, they should be separated. This is possible with stock between the ages of six and eight weeks. Cockerels could then be forwarded to market, or retained until greater development had been made. The cost of feeding and market values for table poultry must govern what action is taken.

*Adult Tick:**Adult tick feeds on bird at night.**It lays from 20 to 100 eggs at one time.**It may lay at eight different times.**Egg:**Hatches in from 11 to 13 days.**They may be found in cracks and crevices.**Seed Tick:**Seed tick when hatched is white in colour.**It has six legs.**It attaches itself to fowl to feed.**Nymph Tick:**It is called a nymph tick after moulting.**It now has eight legs and lives in cracks and crevices.**It feeds on the bird at night and then moults.**This process is usually repeated three times before the tick is fully grown.**Engorged Seed Tick:**Leaves fowl after feeding from 4 to 10 days.**It is then bluish-grey in colour.**It seeks shelter in cracks and crevices and then moults.*

Lesson III.**EXTERNAL PARASITES.****Principal External Parasites.**

Feed on blood ..	{	Poultry tick
		Red mite
Feed on skin and feathers		Body lice of all kinds.

POULTRY TICK.

The tick passes through many stages before reaching maturity. The life cycle of the tick may be briefly described as follows:—

1. The adult female lays eggs in batches of 20 to 100.
2. Eggs hatch in eleven to thirteen days according to climatic conditions.
3. Young tick (seed tick) attaches itself to the fowl, where it remains from four to ten days.
4. After engorging, the seed tick leaves the fowl.
5. After moulting, the seed tick is known as a nymph tick. It feeds again and moults. This process is repeated usually three times.
6. The female tick when fully grown feeds and lays. It may lay as many as eight batches during its life, but feeds between each laying period.
7. The time occupied in passing through all these stages is usually about ten months.

Appearance.—The tick egg is about half the size of the head of a small pin, circular in shape, shiny, and almost colourless. With age it turns a yellowish brown. The seed tick, before feeding, is naturally very small and almost white in colour. It has six legs. After feeding, the tick swells up considerably and is darkish in colour. It still has six legs. The nymph and adult ticks can easily be distinguished by their elongated oval bodies and size. They then have eight legs. When unengorged they are of a dirty yellowish colour, but after feeding they become bluish grey.

Habit.—The seed tick, on hatching, makes its way to the fowl and attaches itself under the wing or leg to feed. This feed may last from four to ten days. On feeding, it leaves its host and secrets itself in cracks and crevices, and moults.

The adult tick and nymph tick may be found hiding in the cracks and crevices of perches, under the perch, in woodwork of poultry house, bark of trees, fowl crates, and, in fact, any place where poultry are kept.

The tick, after its first moult, that is, when it has eight legs, only passes onto the fowl for an hour or so during the night for the purpose of feeding.

Effect.—The poultry tick, by sucking the blood from the fowl, weakens it and reduces the egg yield. It also frequently transmits to poultry a disease known as tick fever. Tick fever is responsible for

heavy mortality. This fever causes a rise in temperature of the bird, diarrhoea, loss of appetite, ruffled plumage, darkening of the comb, and, in many cases, the loss of the use of limbs before the bird dies. Some birds recover from this disease and are immune to future attacks.

Treatment.—Ticks must be destroyed, as treatment for tick fever is impractical. Thorough spraying of fowlhouses at intervals of five days, until the ticks are eradicated, is necessary.

Spraying Mixture.—The spraying mixture that is most economical and efficient is kerosene emulsion. This is made as follows:—Take 1 gallon of water and boil with 1 lb. of good household soap. When boiling remove from the fire and stir in 1 gallon of kerosene. Do this gradually and so get a good emulsion. To this then may be added another 8 gallons of water. In making this spray, use only soft water and, in using the mixture, spray freely.

Longevity of Ticks.—The length of life of the poultry tick is an unknown quantity. Cases have been known of isolated ticks living without feeding on a host for four years and five months. From this it will be seen that it would be most difficult to starve ticks out.

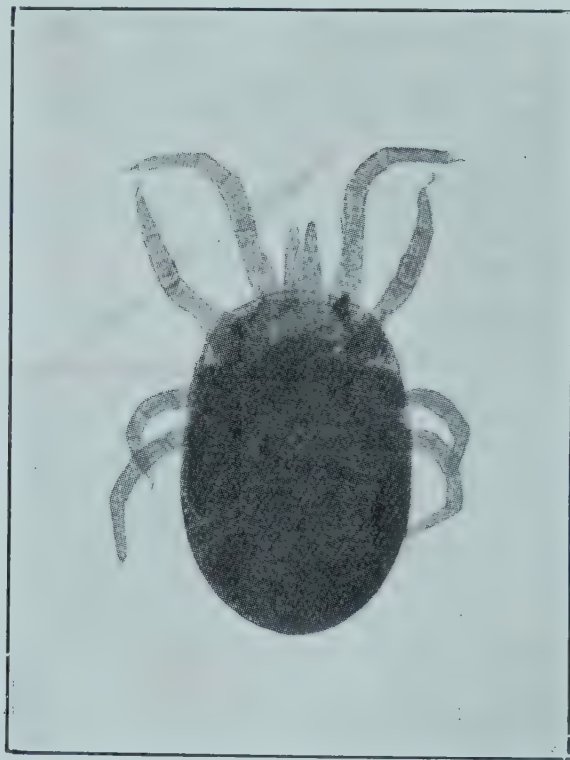


PLATE 158.—RED MITE.

RED MITE.

What it is Like.—The red mite is very minute. When fully grown it is not much larger than the dot used for the marking of the letter “i.” Adult mites have eight legs. They are red in colour when engorged with blood, but before feeding they are white. It only takes eight days for the mite, from the time it leaves the egg, to become fully grown; and, as a mite may live for four months, it will be understood that they multiply very rapidly under favourable circumstances.

Habits.—The mite lives in the cracks of perches, between the perch support and perch, in cracks of the nest boxes, walls of houses, and,

when very numerous, among the droppings and litter in the fowlhouse. They feed on the bird at night by sucking blood, and seek shelter before daybreak in secluded positions.

Effect.—Mites are responsible for reduced egg yields among laying hens on account of the loss of blood, irritation, and broken rest they cause. Young stock, when attacked by mite, do not thrive, and the health of all classes of birds is impaired to such an extent that they fall ready victims to disease organisms.

Treatment.—Light degree of infestation:—Paint perches and perch supports with a mixture of kerosene and waste oil.

Heavy infestation:—Remove from the fowlhouse all loose earth, boxes, perches, &c., and spray thoroughly with a kerosene emulsion, saturating the floor. Treat perches likewise and replace old nest-boxes with new ones. Repeat every week until the pest is eradicated.



PLATE 159.—COMMON LOUSE OF THE FOWL. (MAGNIFIED 37 TIMES.)

From Victorian "Journal of Agriculture."

BODY LICE.

There are many varieties of body lice to which poultry of all kinds are subject. All species of birds have their particular species of lice. Those found on the duck will not be found on the fowl. On the fowl may be found lice of several varieties. Some varieties will be noticed crawling about the skin of the body, while others will be adhering to the feathers.

Lice live on either the outer layers of the skin or the feathers, and this fact accounts to some extent for the position in which lice are noticed.

Effect.—A few lice, with one exception, on a bird appear to cause very little inconvenience. The exception is a louse about one-tenth of an inch long, dark in colour, which lives on the neck and head. Even this louse causes little ill-effect on adult stock, but with chickens and young growing stock it is responsible for heavy mortality.

When lice of any variety, however, are numerous, they cause considerable irritation, with the result that young stock do not thrive and adult stock cease to be profitable.

Male birds are usually infested to a greater extent than females, and become very thin and weak from the effects of lice. This is due to the fact that they do not dust bath as freely as females. Males should be periodically examined and, if infested, receive special attention.

Treatment.—For head louse, which causes such heavy mortality among chickens, it is necessary to catch every bird and lightly smear the feathers around the head and under the beak with olive oil.



PLATE 160.

This seven-weeks-old Single Comb White Leghorn cockerel is suffering from an attack by head lice. Note the unkempt plumage, dark, dried comb, eyes closed and general dejected appearance.

Dust Bath.—Dust baths can be composed of fine road dust and wood ashes. To the dust bath may be added in small quantities flowers of sulphur, tobacco dust, or slaked lime, to make it more effective, but it will be found that by keeping the dust bath slightly moist, particularly in warm weather, the birds will use it more freely and there will rarely be any necessity for making these additions.

Males infested with body lice should be dusted with some good insect powder at fairly frequent intervals, and all feathers around the vent to which lice eggs are attached should be removed. For the flock in general it will be found that a good dust bath will keep lice down to numbers that will not cause discomfort of the stock.

Lesson IV.

INTERNAL PARASITES.

The principal internal parasites of poultry may be referred to as round worms and tape worms. There are many varieties of each kind. Other lower forms of life are parasitical upon birds, but they will be dealt with in "Diseases."

ROUND WORM.

Round worms may be found varying in size from $\frac{3}{8}$ in. in length and as fine as a piece of cotton to 3 in. in length and as thick as a wax match. This class of worm, as the name indicates, is round. Varieties of this worm may be found in the crop, stomach, gizzard, intestines, and blind gut.

The round worm is commonly found in the intestine and blind gut. The largest worm will be found in the former, while small worms $\frac{3}{8}$ in. to $\frac{3}{4}$ in. in length are found in the latter. Gizzard, crop, and stomach worms are not common.

TAPE WORM.

Tape worms vary in size to a greater degree than round worms. Some are so small that it requires a hand lens to detect them, while others may grow to the length of a foot or more.

Tape worms confine their attention to the intestines. The small ones embed themselves in the walls of the intestines, forming small lumps or nodules, and the large hang on by the head, the tail portion floating among the intestine content. The tape worm, as the name suggests, is flat. It is made up of numerous small segments of a chain-like formation, and as the rear portion matures it detaches itself from the chain.

Symptoms of Worm Infestation.—Stock infested with worms become dull, weak, and emaciated. They are sunken in face, and lose colour from both the face and legs. The plumage loses its lustre and has a ruffled appearance. With a medium degree of infestation, stock are ravenous feeders, but as the worms increase in numbers their appetites diminish. They become very stilted in their movements and frequently have diarrhoea.

When several birds in any one flock present the foregoing appearance, worms should be suspected, particularly so if the flock has been well cared for. A more definite opinion can be gained, however, by making an examination of the internal organs of one or more of the weedy looking birds.

LIFE HISTORY OF WORMS.

In order to intelligently cope with worms, it is necessary to have some idea of how birds become infested. The life-cycle of many worms which trouble poultry has not been studied, but sufficient is known of the more common to enable control measures which prove highly satisfactory, to be adopted.



PLATE 161.—PORTION OF INTESTINES OF FOWL INFESTED WITH WORMS.

This interesting photo of worm infestation was obtained by the writer from a white leghorn pullet. The owner had requested the Department of Agriculture to

There is a distinct difference between the life-cycles of round worms and tape worms, but methods for control are not dissimilar, sanitation playing a most important part in both. The life-history briefly is as follows:—

Round Worms.—The worm in the intestine lays its egg, which is voided with the excreta. The egg lies on the soil for some time and undergoes partial development. Moisture is necessary. The bird consumes the partially developed egg adhering to particles of food. The partially developed egg, on entering the digestive tract, hatches. It then commences to feed according to its habit, matures, and lays eggs.

Tape Worms.—The ripe segment of the tape worm is voided with the excreta. This segment contains matured eggs. Flies, slugs, and worms feast on the droppings, taking the eggs into their digestive tract. The egg here hatches, the young penetrating the walls of the intestine, encysting itself in the abdominal cavity. The fly, slug, or worm is then consumed by the bird, with the result that an adult tape worm develops from the encysted stage.

Prevent Infestation.—The round worm is spread from bird to bird by worm eggs. Therefore the following practice should be adopted:—

Never introduce infested stock on to clean premises.

Avoid rearing chickens on land where adult stock have been running.

Have chicken-rearing pens in a position not easily fouled with the washings from adult pens.

Regularly clean poultry houses and pens to reduce the numbers of worm eggs about the premises.

Keep poultry houses and pens as dry as possible.

It is seen that tape worms require an intermediary host, and that they feed on the excrement containing segments of the worms. The regular cleansing of poultry houses and yards will reduce to a great extent the possibility of the tape worm coming in contact with intermediary hosts.

Moist places, such as under boards, bags, feed hoppers, are favourable places for slugs and worms to find cover. Therefore do not have yards littered with such.

Treatment.—No medicament is 100 per cent. efficient, and all treatment needs to go hand in hand with prevention. Otherwise birds are freed from a few worms only to be reinfested.

Round Worm.—Any of the following will prove fairly effective, but individual treatment is recommended:—

1. Mix 1 lb. tobacco dust with every 50 lb. of mash.

2. One or two teaspoonfuls according to age, of equal quantities of medicated turpentine and cotton seed or linseed oil.

This is best administered with the aid of a syringe and a piece of rubber tubing. Draw the dose into the syringe. Place the tube down the bird's neck until the lower end enters the crop, then eject the mixture. This care is necessary, for if the mixture entered the windpipe it would cause asphyxia.

3. For small flocks, capsules containing effective worm medicaments could be obtained.

Tape Worm.—1. One heaped teaspoonful of powdered pomegranate bark added to the mash for fifty birds.

2. Ten grains areca nut given in mash for each bird.

3. Kamala at the rate of 15 grains in mash.

The above is the dose for adult stock. Half-grown birds should receive half the quantities.

Before administering any worm remedies, the birds should be fasted for twenty-four hours. This is best done by not feeding an evening meal and treating stock the following morning. Follow all treatment in the course of two hours with a dose of salts, at the rate of 1 oz. to the gallon of drinking water.



PLATE 162.—TAPE WORM.

a.—Worm;

b.—An inverted piece of chicken's intestine with numerous tape worms attached.

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Lesson V.

COMMON DISEASES.

The diseases that frequently occur among young growing stock are chicken-pox, canker, roup, leg weakness, and scaly leg.

The three former troubles are of a highly contagious nature, and the methods that should be adopted for the prevention and control of all are similar. In considering how to control and prevent disease, the two following points have to be borne in mind:—

1. Stock in good sound physical condition are not so susceptible to diseases as those that are weak and weedy.
2. Disease organisms do not multiply rapidly when poultry houses are kept in good sanitary condition.

DISEASE PREVENTION.

To maintain stock in good physical condition, the following conditions must apply:—

1. The stock must be the offspring of sound parents.
2. They must not be overcrowded at any stage of their life.
3. An ample supply of suitable foods must be given.
4. Every precaution must be taken to prevent their being preyed upon by both internal and external parasites.

To maintain the premises in good sanitary condition the following points have to be considered:—

1. Site on which buildings are to be erected.
2. Roofing of fowl sheds.
3. The drainage around fowlhouses and runs.
4. The regular cleaning of the houses and runs.

DISEASE CONTROL.

The first point of control is to isolate any sick bird and to remove any bird to other quarters which shows the slightest signs of trouble. Pens and runs should be thoroughly cleaned, despite the fact that they may have received recent attention.

After the cleaning, the sleeping quarters should be thoroughly sprayed with some good disinfectant. The water vessels are a medium by which disease is very easily transmitted, and they should be cleansed and disinfected daily.

If the custom has been to feed dry mash, wet mash should be substituted. Feeding troughs should be emptied, say, half-an-hour after the mash has been distributed. The troughs should then be disinfected.

In the event of an outbreak of disease, the above methods should prevent its rapid spread among the flocks and, in time, eradicate it, but it is necessary to be able to detect disease and treat sick stock.

CHICKEN-POX.

This disease affects all classes of poultry, but is more pronounced among young stock, particularly those hatched late. It is prevalent during the period from November to April. Once stock have been affected, they appear to be immune to further attacks.



PLATE 163.—CHICKEN-POX ON COCKEREL.

Symptoms.—Wart-like growths are noticed on the bare parts of the head and comb. In early stages these warts are little more than small yellow eruptions. When the disease is severe, there is an elevation of temperature, diminished appetite, and general dullness.

Treatment.—Isolation of sick birds and painting of wart-like growths daily with one of the following:—

1. Carbolic glycerine—1 part carbolic acid and 15 parts glycerine.
2. 5 to 10 per cent. solution of iodine.
3. 10 grains silver nitrate to 1 ounce of water.

CANKER.

All classes of poultry are subject to a cheesy-like growth in the mouth. This is termed "Canker," and it frequently associates itself with chicken-pox and roup.

Symptoms.—The symptoms are not very pronounced, as affected birds frequently appear to be perfectly healthy. It may be noticed at times that a bird has difficulty in closing its mouth or in swallowing. Examination may show a cheesy-like growth on the upper or lower portion of the side of the mouth or sometimes on the windpipe.



PLATE 164.

The lower jaw of two birds, showing canker growths. Note how tongue is displaced by pressure from growths.

Treatment.—Isolate affected bird. Remove as much growth as possible with a small piece of smooth wood. Paint surface with 10 per cent. solution argyrol, 10 per cent. solution iodine, or dust with small quantity of powdered bluestone.

If the disease persists, despite daily treatment, destroy the bird.

ROUP.

The term "Roup" is applied in a general sense to a discharge of a catarrhal nature of the nostril (contagious nasal catarrh), inflammatory condition of the eyes (eye roup), discharge from the nose and lesions in throat and mouth (diphtheritic roup).

CONTAGIOUS NASAL CATARRH.

Symptoms.—Discharge from nostril of very offensive odour, causing litter and dirt to adhere to beak. Breathing from the mouth on account of stoppage of nostril. Continued sneezing to free nostril. Sick birds stand apart from flock with ruffled feathers and drooping wings. Loss of appetite.



PLATE 165.—ADVANCE STAGE OF CONTAGIOUS CATARRH.
Nostrils blocked. Collection of mucus forcing mouth open.

Treatment.—Destroy birds badly affected. Isolate any to be treated. Submerge head twice daily for about half-a-minute in one of the following solutions to thoroughly cleanse nostrils:—

1. Equal quantities of hydrogen peroxide and water.
2. A 2 per cent. solution of permanganate of potash.
3. Ten grains of silver nitrate to the ounce of water.

In addition, administer one teaspoonful twice daily of olive or cotton-seed oil to which has been added three drops of kerosene and three drops of eucalyptus.

EYE ROUP.

Symptoms.—Eyelids become stuck together with the discharge. This causes a pronounced swelling, and, on the eyelids being prised apart, a cheesy-like substance can be seen. It may affect one or both eyes, one eye usually.

The inflammatory condition causes intense irritation, and the bird is constantly wiping its eye on the wing, with the result that the feathers are soiled.

Treatment.—Isolate affected birds. Force apart the eyelids and remove collection of solid matter. Submerge head, as recommended for nasal catarrh. Place in eye twice daily one or two drops of a 10 per cent. solution of argyrol.



PLATE 166.—EYE ROUP IN EARLY STAGES.

The dirty patch on the wing is a warning of eye trouble.

DIPHThERITIC ROUP.

Symptoms.—Discharge from nostril of a very offensive odour. Rise in temperature and thirst, and sometimes diarrhœa. Patches of greyish or yellowish growth tissue appear in mouth and throat. Loss of appetite and disinclination to move about.

Treatment.—Destroy severely-affected birds and isolate those to be treated. Cleanse head as recommended for catarrh. Remove as much of the growths in mouth and throat as possible without causing bleeding.

Paint the raw area with any of the following:—

1. 10 per cent. argyrol.
2. 10 per cent. iodine.
3. 10 grains of silver nitrate to the ounce of water.

Renew drinking water three times daily, and add sufficient permanganate of potash to make it a good pink colour.

LEG WEAKNESS.

Symptoms.—The bird may suddenly lose the use of one or both legs or, in the early stages, there may be a slight stiltiness of walk noticed.

Cause.—Due to diet deficiency, intestinal worms, disease, or damp quarters.

Treatment.—Leg weakness does not respond too readily to treatment. Ascertain the cause and try and remove it. Paint affected leg with 10 per cent. iodine.



PLATE 167.—ADVANCED STAGE OF SCALEY LEG.

SCALEY LEG.

Symptoms.—Roughened appearance of the leg on account of the elevation of the scales due to a collection of a whitish crust.

Cause.—A small mite which lives on the skin under the scales.

Treatment.—Paint legs and feet with one of the following:—

1. One part kerosene and one part oil or fat.
2. Carbolised glycerine.
3. Equal parts sulphur and lard.

FODDER CONSERVATION.

AN ANALYSIS OF REQUIREMENTS.

The importance of "stock insurance" by means of fodder conservation was emphasised in these notes recently when the financial advantages of the security so afforded were pointed out. Discussing the requirements of such a scheme, the departmental writer from whose report these paragraphs are taken sets out a dual objective, namely—

1. Provision of adequate fodder supplies for the requirements of the farm.
2. The conserving of a marketable surplus.

The main considerations in the firstmentioned are—

- (a) Ample reserve to cover requirements;
- (b) The provision of a well-balanced ration;
- (c) Provision of a suitable and effective protection against fire, flood, and damage from mice, stock, &c.;
- (d) Location of reserves with a view to ease and cheapness of feeding;
- (e) Cost of conservation.

A safe guide in assessing the quantity of fodder required for one's own use may be based on the following ration for one sheep per day:—

- 1 lb. cereal or lucerne hay;
- 4 oz. grain (crushed oats for preference);
- 2 lb. silage.

Roughly, 122 tons of hay, 31 tons of grain, and 244 tons of silage are required for feeding a flock of 1,000 sheep for a period of nine months. It is a wise precaution, however, to carry reserves capable of tiding one over twelve months.

The provision of a well-balanced ration is essential. Stock continually eating one particular class of fodder generally evince a dislike for it after prolonged feeding, and fail to maintain the same condition as in the early stages of feeding.

Protection of Stored Fodder.

Adequate protection of the fodder stored is essential, both from a directly economic point of view and in relation to the accurate assessment of one's stocking capacity—it is hard to estimate one's loss when on opening up drought reserves one finds a large percentage unfit for consumption. In the case of stored hay, dunnage should be placed under all stacks to obviate damage from absorption of moisture from the soil. If possible hay straddles of an approved design should be erected, more especially where oaten hay is concerned and intended to be stored for a number of years. This particular class of fodder is most liable to damage from mouse infestation. Well sloping roofs, suitably thatched, are very desirable, and amply repay the additional cost involved.

When thatching, the use of the tie wire in place of binder twine will be found to give more satisfactory results. Weather soon rots the twine, necessitating repair usually in the second year. Again, in stack construction, the higher the walls can be carried the greater the compaction and the less likelihood of damage from mice. The cost of sound stock-proof fences round stacks is fully justified by the protection afforded. Where possible, hay stacks should possess at least a small measure of cover by insurance. In addition, fire breaks should be made a suitable distance from one another so that in the event of fire only an isolated stack is destroyed.

Protection of Silage.

In many cases due attention is not paid to the protection of silage. In the first place it is highly desirable to allow the pit to settle during filling operations, which latter should never be too hasty. After allowing time for settling, the silage should be built above ground level to a height equal to the depth of the pit. This prevents the covering sinking below ground level and forming a miniature dam for the accumulation of water, and subsequent percolation and damage. The covering should be of ample depth (2 ft. 6 in. at least). The use of horses driven backward and forward while topping the pit will do much to consolidate the earth and leave an impervious top. The covering should be nicely moulded up with a good slope and suitable drains placed down each side of the pit at the surface to carry off all water.

In the selection of sites for silo pits, due consideration must be given to surface drainage and to the possibility of strata resulting in seepage into the pits.

Iron Bins for Grain.

Grain is most satisfactorily stored in galvanised-iron silos. This method of conservation is fast gaining popularity, and is certainly superior to storage in sheds. The advantages of such bins lie in the facts that they are mouse and weather proof, and their construction permits of fumigation of the grain if necessary. They also have the big advantage that at the termination of feeding the remainder of the fodder is safely conserved without further expense in protection, as is the case with hay stacks and silo pits when they have been opened and their contents not fully consumed.

Where possible, reserves should be in close proximity to water and feeding paddocks, expense in feeding being thereby minimised.

Attention should be given to the baling of hay for drought reserves. Greater protection is afforded from mice by storage in sheds, less space is occupied, and when feeding out it is more economical to handle, and the ration fed is more easily computed. Moreover, it is in a handy form to market immediately if desired.

In studying the costs of fodder conservation, the aim should be to obtain the greatest measure of protection with the minimum of expense. Where large areas of lucerne are cut, the adoption of modern machinery for handling it should receive consideration.

The marketable surplus referred to earlier is best confined to cereal or lucerne hay and oat grain.—“A. and P. Notes,” N.S.W. Dept. Ag.

MALNUTRITION.*

By J. C. BRÜNNICH, Agricultural Chemist.

A GREAT majority of our pastoralists had during the last few years a very serious setback on account of drought conditions, and therefore it became necessary to give some advice as to how such conditions may be mitigated, by drawing attention to mistakes made by many and beneficial results obtained by others through the use of licks, &c., during the past season.

The great aim of all animal husbandry is increased production, and this again depends almost entirely on the feeding of stock. Any errors in the feeding will cause malnutrition and disease.

Food Constituents.

Every one is familiar with the chief constituents of foods, which are—

- (1) Proteins, nitrogenous compounds, the important flesh-forming nutrients;
- (2) Carbohydrates (as sugar, starch, &c.) and fats, all nitrogen-free compounds which build up fatty matter and produce heat and energy;
- (3) Mineral matters, which enter into the formation of bones, teeth, blood, and other fluids of the body; and finally
- (4) “Vitamines,” accessory foodstuffs of which very minute quantities are required for a complete maintenance of health and normal development of the animals, and generally well supplied in green pasture.

The requirement of mineral matter or salts received but very scanty attention until recent times.

The fact that all foodstuffs contain certain amounts of mineral matter, left in the form of ash, when fodders are burned, was well known, and it was generally accepted that any animal fed in a natural way on common ordinary rations like grass, hay, and grain, would receive a sufficient amount of the mineral constituents with the food, which supplied the necessary amounts of proteins, fat, and carbohydrates for its maintenance and growth.

In all living matter the following inorganic constituents are found:—The non-metallic elements—Phosphorus, sulphur, silicon, chlorine, iodine, and fluorine. The metallic elements—Potassium, sodium, calcium, magnesium, iron, manganese, and aluminium; and probably traces of several other elements.

*A summary of lectures delivered to the pastoralists in different centres along the Great Northern and Central Railway Lines.

It is a false idea to think that the minerals are required for bone formation only. The inorganic constituents are as essential to animal life as the ordinary organic food constituents, proteins, fat, and carbohydrates. The most important function of the food minerals are performed in the soft tissue and in the blood, where they are essential constituents of living matter, and therefore they stimulate and control directly or indirectly all vital processes.

Functions of Mineral Constituents.

The chief functions of the mineral constituents performed in the animal body are the following:—

1. They are necessary for the maintenance of a proper physiological balance between the mineral elements in the body fluids. Any excess or deficiency of any one of the mineral constituents will affect the vital processes. A deficiency of potassium in the blood will act on the heart muscle and prevent it from relaxing properly, while an excess makes it relax so much that it stops beating. Common salt is an absolute necessity for nutrition, but given in excess will act as a poison and cause serious troubles. The mineral constituents maintain the practically neutral reaction of the blood.

2. They are necessary for the process of digestion. The digestive processes are affected by acidity and alkalinity of the digesting fluids. In the stomach an acid reaction must exist to aid in the pepsin digestion, whereas in the small intestine an alkaline reaction is necessary to allow the trypsin to act. The absorption of the digested products again is controlled by the concentration of the salts, and this concentration will also affect the passage of digested and undigested material along the intestines.

3. Mineral constituents are required as constructive material for the formation of new tissue and building up of the bone skeleton.

4. Milking animals require larger supplies of mineral matters to keep up the yield and average composition of the milk secreted.

Considerations of Modern Research.

Modern research dealing with the mineral nutrition of farm animals has to consider—

1. Mineral requirement of the various species of farm animals.
2. The correct balance or proportion between the different constituents.
3. Relationship between the inorganic and organic portions of the ration.
4. Effect of outside factors, like sunlight and exercise on the mineral metabolism.
5. Study of diseases caused by faulty mineral nutrition.
6. Mineral constituents of various food stuffs.

1. Of the mineral elements required in the largest amounts for growth, &c., calcium or lime and phosphorus or phosphoric acid stand out on their own, and this is very clearly indicated by the large amounts of both found in the milk of the lactating animals. It will be noticed that the faster the growth of the young animal, the greater the amount of mineral matter required and supplied by its mother's milk.

Species.	Time Required to Double Weight.	Composition of Milk.					
		Protein.	Fat.	Sugar.	CaO.	P ₂ O ₅	Ash.
	Days.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Woman ..	180	1.6	3.3	6.2	0.049	0.056	0.25
Horse ..	60	1.8	1.2	6.9	0.120	0.130	0.30
Cow ..	47	3.5	3.8	4.8	0.161	0.189	0.75
Sheep ..	15	6.7	8.6	4.3	0.250	0.290	0.97
Pig ..	10	7.2	4.6	3.1	0.395	0.357	1.05
Rabbit ..	6	15.5	10.5	2.0	0.89	0.99	2.56

For every 100 lb. of live weight a sheep or a pig requires about 1 lb. of lime and nearly 1 lb. of phosphoric acid, a calf requires about double these amounts and rather more phosphoric acid than lime. As a rule only about one-half of the

lime and phosphoric acid supplied in the food can be assimilated and retained, and therefore the actual amount of food consumed should contain at least double the quantities absolutely necessary.

2. The balance or proportion between the different mineral constituents is now recognised to be of importance, and any serious alteration in the balance between two or more elements may affect assimilation, not only of these elements, but also of other constituents of the ration.

3. The relationship between inorganic and organic constituents of rations is shown by the fact that a ration which contains ample amounts of protein fat and carbohydrates may fail to produce normal growth if it is deficient in one or more of the mineral constituents. Addition of such will at once give increased growth and a much better utilisation of the food stuff.

4. Experiments have shown that sunlight and even artificial irradiation, lead to an improved lime and phosphorus assimilation, and may even make up for the want of vitamine D.

5. Diseases due to deficiencies of mineral matters have been reported from all parts of the world, and a concentrated attack to deal with such diseases is being made the last few years throughout the Empire.

Investigations on Phosphorus Deficiency.

Sir Arnold Theiler, with a large staff of workers, made a very complete investigation on phosphorus deficiency as the cause of several diseases in South Africa, which were completely checked by giving the cattle liberal doses of bonemeal.

A full copy of his report appeared three years ago in the "Queensland Agricultural Journal" for March, 1925. Unfortunately, not much notice of the importance of his discovery was taken by readers at the time, and only his personal visit to the Commonwealth gave a fresh stimulus to this matter, more particularly as both he and Dr. J. B. Orr, Director of the Rowett Research Institute, Aberdeen, another oversea visitor to our States, clearly recognised similar wants in our pasture as well as clear signs of malnutrition. The principal sickness due to phosphorus deficiency in South Africa, is the Styfsiekte or stiffness, with its most obvious outward sign of bone chewing, or osteophagia. This is a specific form of depraved appetite, showing by cattle having a predilection for bones, chiefly bleached bones. In more aggravated cases even putrifying bones and rotten carcasses are eaten. The animals are easily tested in practice if they are marked cravers, slight cravers, or non-cravers, which is very useful for experimental purposes. The osteophagia is a precursor of serious diseases, stunted growth, poor condition, and heavy mortality. Feeding the animals with 3 oz. of bonemeal per head per day absolutely controls the disease, and enormously improves the condition of the cattle.

A few diagrams shown in Sir Arnold Theiler's report, which is republished in full in the September number of the Journal, clearly demonstrate the improvement in growth, increase of food consumed, &c. Particularly interesting is the quick change which takes place when batches of the experimental animals have their treatment reversed, the controls receiving bonemeal, and the bonemeal withdrawn from others. The change in the animals manifests itself in a very short time, and the recovery of some is simply marvellous.

Seasonal changes should also be noted, and the quick improvement in cattle following spring rains.

The phosphorus was supplied in various forms, but the results obtained were the same. Addition of lime did not prevent osteophagia, but rather increased the evil. Bonemeal as the best and cheapest form of phosphatic available in South Africa was chosen for general use. Mineral phosphates were tried, but were found too costly and rather difficult of digestion; superphosphate was found to cause digestive troubles. Precipitated calcium phosphate behaved very much like bone phosphate. In finely ground Nauru and Ocean Island phosphate we have a natural pure tricalcic phosphate which can be safely used in place of bonemeal.

Application of phosphatic fertilisers to pasture, in South Africa using 500 lb. superphosphate per acre, produced the same results as bonemeal feeding, but, of course, this is of not much practical value to our pastoralists, as phosphatic manuring on a large scale would not be an economical proposition.

The want of phosphorus was traced by Sir Arnold Theiler and his co-workers to the pastures and to the soil itself, and in all the affected areas, the soil showed a great lack in available phosphoric acid, being generally less than .001 per cent.

There can be no doubt that our stock suffer to some extent, more so in certain districts, from a phosphorus deficiency, which becomes more evident and pronounced in drought periods. A supply of phosphorus just or barely sufficient for maintenance is quite inadequate for reproduction and growth. Sir Arnold Theiler's results showed that a breeding cow requires in the earliest stage of pregnancy only about 2 oz. of bonemeal per head per week more than an ox, whereas in an advanced stage of pregnancy as much as 28 oz. bonemeal per week were required to prevent osteophagia.

Comparison of Composition of Pasture Grasses.

Of particular interest is the study of the following table giving the composition of pasture grasses as found in South Africa, in Queensland, &c., as compared with good European pasture.

Analysis of Water Force Material.

	Protein.	Fibre.	Ash.	CaO.	P ₂ O ₅ .
	%	%	%	%	%
Fattening Pasture, Romney Marsh, eaten ..	22.9	20.2	8.7	0.99	1.01
Fattening Pasture, Romney Marsh, non-eaten	13.5	28.2	5.6	0.75	0.65
Non-fattening, Romney Marsh, eaten ..	21.1	20.2	7.6	0.90	0.89
Non-fattening, Romney Marsh, non-eaten ..	12.3	29.2	5.6	0.73	0.58
Poor Average Pasture, England, eaten ..	15.9	25.2	5.5	0.56	0.60
Poor Average Pasture, England, non-eaten ..	11.4	29.3	3.1	0.30	0.37
Pasture, Falkland Island, eaten ..	12.2	..	4.6	0.29	0.54
Pasture, Falkland Island, non-eaten ..	7.0	..	2.5	0.14	0.25
Mixed Pasture, South Africa, November ..	19.4	22.5	11.6	0.31	0.60
Mixed Pasture, South Africa, January ..	13.8	25.0	7.7	0.50	0.22
Mixed Pasture, South Africa, March ..	7.2	33.7	5.9	0.43	0.24
Mixed Pasture, South Africa, May ..	4.1	34.9	5.9	0.50	0.07
Mitchell Grass, Queensland, green, 1926-27 ..	7.9	31.7	10.9	0.62	0.38
Mitchell Grass, Queensland, yellow, 1926-27 ..	6.0	28.9	10.7	0.44	0.20
Mitchell Grass, Queensland, roughage, 1926-27	2.8	32.9	10.0	0.38	0.12
Mitchell Grass, Queensland, midgrowth,	5.5	41.0	12.3	0.57	0.37
1913-14					
Queensland Average Mixed Pastures (15 samples)	6.3	41.2	11.9	0.49	0.45
Paspalum Pasture, Unfertilised, 9 days old ..	8.2	25.4	12.7	0.72	0.55
Paspalum Pasture, Unfertilised, 44 days old	6.8	29.8	11.9	1.15	0.37
Paspalum Pasture, Fertilised, 9 days old ..	15.5	24.1	13.3	0.50	0.66
Paspalum Pasture, Fertilised, 44 days old ..	7.4	35.9	10.2	0.63	0.40

The most striking feature is the high percentage of protein, lime, and phosphoric acid, calculated on the water free material, found in the pastures readily eaten by sheep on Romney Marsh, England.. The pasture not eaten is still very much richer than the best of our own pastures. On Falkland Island, which is heavily stocked, a considerable falling off in the stamina of the sheep has been noted and is due to the fact that the pasture was never fertilised. The mineral constituents lime and phosphoric acid are very low. The great falling off in nutritious quality of the South African pastures with age is clearly shown, more particularly the great reduction in the phosphoric acid contents of the ash, which is quite good in November, becomes already low in January and March, and falls away to practically nothing in May.

A similar condition exists in the Mitchell grass pasture and a distinct want of phosphoric acid in the older growth is to be noticed.

The great increase in the protein contents of paspalum pasture due to application of a complete fertiliser, with an extra supply of nitrogenous manure, is also worth noting.

Lack of Protein.

It has been found that the supply of lick will lead to greater consumption of fodder, and greatly help in the digestion and assimilation of all nutrients, but after all it cannot create protein if it is not there, and the actual value of a

feed must depend principally on the amount of protein it supplies. I have repeatedly expressed the opinion that our stock are suffering for long periods of their existence of a protein starvation, with or without lime and phosphorus deficiencies. Lime itself is but very rarely deficient, but phosphorus is, although not in such a pronounced degree as found by Sir Arnold Theiler in South Africa. Only in very isolated cases our soils contain less than 0.01 per cent. of available phosphoric acid, which means about 300 lb. per acre foot, whereas the soils in South Africa, showing disease, have only .001 per cent. or 30 lb. per acre foot. For years very full analyses of grasses, fodders, &c., have been carried out in our agricultural laboratory, and only in a very few cases such low amounts of phosphoric acid have been found in the samples as are recorded in South Africa.

Sheep Affected by Malnutrition.

Sheep will be affected by malnutrition in a similar manner, although the outward symptoms are rarely so pronounced as with cattle. Bone chewing, and more frequently licking up of earth, are noticed; an excessive liking for salt is also an indication of depraved appetite. The fact of sheep licking certain soil does not indicate that such soil would make a good lick, as many a correspondent to this Department has asserted. The far-reaching results of malnutrition are shown by stunted growths, loss of fecundity, poor percentage of lambing, great mortality among young lambs, greater liability to suffer from worms, and attack by blow flies. Of course all these symptoms become more pronounced during periods of drought. A large number of pastoralists tried to save their sheep from starvation by giving them salt licks, and in many cases where the drinking water was also saline, actually killed the sheep through salt poisoning. The actual amount of salt required by sheep is extremely small, only about 4 to 5 lb. of salt are required per annum, and this quantity is generally fully supplied in the pasture grass, and drinking water. The other mineral constituents, lime and phosphoric acid necessary for the maintenance of an adult sheep, are generally supplied by good natural pasturage, but in the case of ewes the requirements increase rapidly during pregnancy and remains high during the lactating period, so that the amounts supplied by pasturage are in a great number of places not sufficient to cover the demand. The requirements of a young growing lamb are equally high, and from two to three times greater than those of an adult sheep.

The actual amounts of lime and phosphoric acid removed from the soil by wool and sheep are very small, amounting to a few ounces per acre annually; even with fairly heavy stocking of, say, one sheep to 2½ acres, the amount of lime phosphate removed would be approximately only 1 lb. per acre per annum; so that, with an average amount of one-hundredth of a per cent. of available phosphoric acid in a soil, the supply would last many hundred years. Unfortunately, the situation is not quite as favourable as it appears at first sight. Stock naturally prefer the best and most succulent fodders and remain in such localities, and as a consequence the best and most nutritious grasses are eaten out continually and are likely to disappear and be replaced by coarse, poor varieties. As previously pointed out, amounts of mineral constituents must be available in large excess, both for vegetable and animal growth.

Analyses of Soil.

Mr. J. E. Thomas, when making his investigation on the feeding of sheep under drought condition, drew particular attention to the great difference between the pebbly and rolling downs in Central Queensland with regard to nutritive value and palatability of the grasses. The pebbly downs always show a much higher lambing percentage, better growth and yield of wool. These facts were explained by analyses of the soils made in our laboratory. The physical condition of the pebbly downs soil was much better than that of the clayey downs, showing much better capillarity. Humus and nitrogen contents of both soils were rather low, lime plentiful both total and available amounts, the amount of available phosphoric .0195 per cent. in pebbly downs soil against .0014 per cent. in clayey down soil, which is dangerously low. The actual amount of feed grown in good seasons is much larger on the rolling downs soil, but the fodder is not so well relished as the sparser growth, but more varied and palatable feed of the pebbly downs.

The principal fodder grass in the western country is Mitchell grass, which is the most drought resistant of our grasses, but its nutritive value is generally very much overrated. The quality varies very much according to seasons, as shown by a great number of analyses, but is at its best in its young growth.

Flinders grass requires a better rainfall than Mitchell grass, but is a more nutritious and more palatable grass, even in the drying-off stage.

A Valuable Preparation for Graziers—

*Mr. Phillip A. Wright, of "Wallamumbi," Armidale, N.S.W.,
and "Keandon," Inglewood, Queensland, writes under date 24th
March, 1928—*

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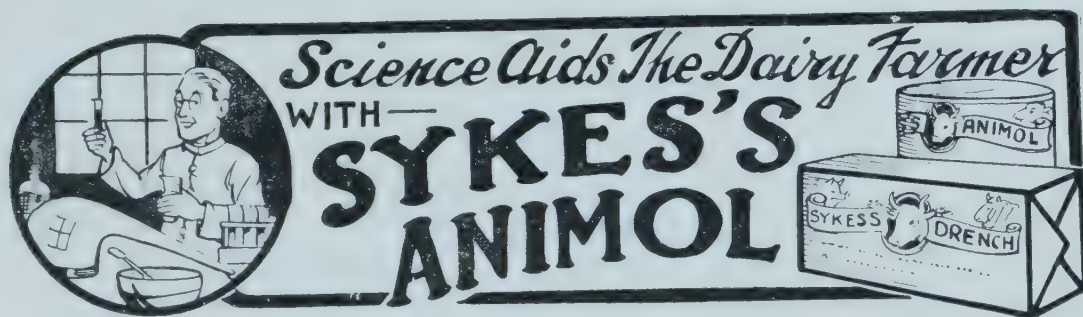
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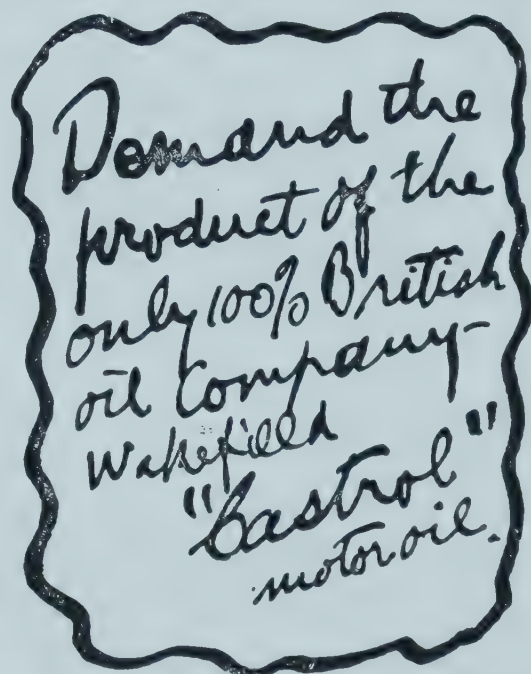
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Queensland Branch: Bridge Street, Valley, Brisbane

Blue grasses require a still heavier and more evenly distributed rainfall and are highly nutritious in their earliest stages of growth, but lose their nutrition value very quickly when drying off.

Edible herbs and shrubs are available in most districts, although restricted in the main areas of Central and Northern-West Queensland.

Looking over a short list of analyses of such fodder plants, it will be noted many of them are of high food value. The prickly acacia bush stands out on its own on account of high protein contents, and is therefore greatly relished by stock.

Food Supply in Time of Drought.

The greatest problem facing the stockowner is the feeding during drought periods. From the previous remarks it is quite evident that the roughage available in such periods is of exceedingly low feeding value, and therefore the problem resolves itself into supplies of proteins, minerals, and roughage itself.

Proteins can be supplied principally in forms of maize and other grains, and prepared concentrated fodders in the form of nuts or cubes, in which mixtures of all sorts of grains, by-products, and milling offals can be utilised with advantage.

Lucerne hay is of great value, being high in protein and minerals, and at the same time is a palatable roughage, but, unfortunately, high cost limits extensive use. The supply of roughage is the most serious problem in drought time, as it is quite impossible to maintain sheep on licks or grains alone.

What could be done with regard to conservation of fodder for roughage, bush hay, and perhaps in some cases fodder crops, chiefly sorghums, are problems of the future. In the meantime the liberal use of phosphatic licks will improve matters, and stock should be allowed to make the best use of poor coarse fodders, this being advantageous to the grazier in good and bad seasons.

Licks Recommended.

The lick at present recommended, and already successfully used in several places, is made by mixing one part of coarse salt (free from large lumps) with two parts finely ground Nauru or Ocean Island phosphate.

Nauru phosphate is an excellent substitute for bonemeal, as it is cheaper and contains a much higher percentage of lime and phosphoric acid than bonemeal. It is just as digestible as bonemeal, being soluble in weak acids on repeated extraction. The reports spread by some interested persons that Nauru phosphate has caused digestive troubles and ulcerated intestines is absolutely without foundation. Professors McCollum, Hart, and Fuller proved nearly twenty years ago that pigs could be equally well supplied with the necessary phosphorus in the form of inorganic phosphorus compounds, such as precipitated calcium phosphate, mineral phosphates, &c., as in the form of organic phosphorus compounds such as those found in bran, &c. (Research Bulletin No. 1 of the Agricultural Experiment Station, of the University Wisconsin, June, 1909.)

The use of phosphatic licks is of particular importance when feeding on scrub, as practically all our western scrub trees contain in the ash of their leaves a very large amount of lime and very little phosphoric acid. Any large excess of lime accentuates the want and deficiency of phosphorus.

When feeding very dry, coarse roughage, the addition of small amounts of Epsom sales, about 10 lb. to every 100 lb. of lick, is advisable. In very rare cases the addition of about 3 to 5 per cent. of flowers of sulphur, and/or 2 to 3 per cent. of iron sulphate (green vitriol) may have a beneficial effect.

Quantity of Licks to be Supplied.

It is of importance that the stockowner has a rough idea how much lick the animals actually consume; a lamb or a wether should get about 2 oz. of phosphate, or 3 oz. of the mixed lick per week; a ewe with lamb can get up to 6 oz. of phosphate per week. As the Nauru phosphate has neither taste nor odour, the animals in some cases do not take readily to the lick, and in such cases sprinkling the lick with a little molasses, or adding about 5 to 10 per cent. of linseed meal, or any other meal to the lick will induce the animals to eat the lick more readily. The addition of these materials is discontinued or reduced when a sufficient amount of lick is consumed. An extra amount of phosphate will not hurt the sheep, but an increased amount of salt may do serious harm. Keep a supply of lick going the whole year round, so that the animals can get it any time they want it.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER, 1928, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1928 AND 1927, FOR COMPARISON.

				AVERAGE RAINFALL.		TOTAL RAINFALL.						AVERAGE RAINFALL.		TOTAL RAINFALL.	
Divisions and Stations.				Oct.	No. of Years' Re- cords.	Oct., 1928.	Oct., 1927.	Divisions and Stations.				Oct.	No. of Years' Re- cords.	Oct., 1928.	Oct., 1927.
<i>North Coast.</i>				In.		In.	In.	<i>South Coast— continued:</i>				In.		In.	In.
Atherton				0·88	27	0·07	0·59	Nambour				2·98	32	0·72	4·37
Cairns				1·84	46	0·05	1·72	Nanango				2·30	46	1·26	3·38
Cardwell				1·95	56	0·13	2·11	Rockhampton ...				1·80	41	1·26	2·19
Cooktown				1·03	52	0	0·10	Woodford				2·50	41	0·78	2·55
Herberton				0·89	41	0·04	0·86								
Ingham				1·55	36	0	1·66								
Innisfail				2·89	47	0·08	3·35								
Mossman				2·83	15	0·34	4·22								
Townsville				1·24	57	0·62	0·45								
<i>Central Coast.</i>								<i>Darling Downs.</i>							
Ayr				0·97	41	0	0·19	Dalby				2·04	58	1·07	2·66
Bowen				1·05	57	0·04	0·90	Emu Vale				2·18	32	1·60	4·50
Charters Towers ...				0·67	46	0·19	0·35	Jimbour				1·88	40	2·25	2·87
Mackay				1·78	57	0	1·98	Miles				2·00	43	0·27	2·83
Proserpine				1·80	25	2·09	3·25	Stanthorpe				2·55	55	1·83	2·62
St. Lawrence				1·77	57	3·21	3·01	Toowoomba				2·56	56	1·85	3·16
								Warwick				2·28	63	1·55	2·99
<i>South Coast.</i>								<i>Maranoa.</i>							
Biggenden				2·29	29	0·49	3·41	Roma				1·77	54	0	2·99
Bundaberg				2·01	45	0·45	3·01								
Brisbane				2·56	77	1·30	7·15								
Caboolture				2·50	41	1·44	2·55								
Childers				2·46	33	0·27	4·86								
Crohamhurst				3·33	35	1·53	5·74								
Esk				2·47	41	1·79	6·68								
Gayndah				2·37	57	0·44	4·19								
Gympie				2·69	58	2·25	4·54								
Kilkivan				2·59	49	3·14	5·09								
Maryborough				2·68	56	0·48	7·05								
								<i>State Farms, &c.</i>							
								Bungeworgorai ...				1·47	14	0·25	2·12
								Gatton College ...				2·04	29	1·39	2·84
								Gindie				1·40	29	...	2·32
								Hermitage				1·90	22	1·26	3·46
								Kairi				1·01	14	0·28	0·70
								Sugar Experiment Station, Mackay				1·54	31	0	1·86
								Warren				2·02	14	0·47	2·58

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for October this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

QUEENSLAND RAIN-FOREST TREES

By W. D. FRANCIS, Assistant Government Botanist.

Oliver's Sassafras (*Cinnamomum Oliveri*) is illustrated by the accompanying pictures. It is a large tree, attaining a height of about 130 feet. The bark is brown or dark brown in colour and is rough with hard, pustular processes, especially on large trees. The bark is also strongly fragrant, the odour resembling that of sassafras. The wood is pale or yellowish when green; when seasoned it is pale brown. The sassafras-like fragrance persists in the wood even when it is aged. The wood is very suitable for indoor work, such as lining and cabinet-making. The trees are found in the rain forests from Port Macquarie in New South Wales (R. T. Baker) to Eungella Range (west of Mackay), Queensland.



Photo: W. D. Francis.

PLATE 168.—OLIVER'S SASSAFRAS (*Cinnamomum Oliveri*).

A large tree in the rain forest to the east of Traveston. The peculiar pustular bark is shown in the picture.



PLATE 169.—HERBARIUM SPECIMENS OF OLIVER'S SASSAFRAS.

A shows a dry fruit partly detached from the cup-shaped perianth tube which surrounds the fruit at base. The minute pustular marks on each side of the midrib of the leaves on the left represent scale insects. A flowering specimen is shown on the right. The minute pustular marks on each side of the midrib of the leaves on the right represent scale insects.

INKWEED ERADICATION.

By N. A. R. POLLOCK, Northern Instructor in Agriculture.

Experiments Conducted.

The greatest trouble that settlers experience in many of the heavy scrub areas of Queensland in grassing land, on which the felled scrub has recently been burnt off, is due to the heavy and persistent growth of Inkwood (*Phytolacca octandra*), which if not destroyed, soon covers the ground and smothers the young grass shortly after the seed has germinated. The most satisfactory and economical method of dealing with the trouble will be found, it is considered, in pulling up the young Inkweed plants as they appear, thus giving the young grass opportunity to become established, after which germination of further Inkweed seed or growth of same after germination will be greatly impeded. By this means a stand of grass is secured the first year, the value of which is apparent.

In certain areas, however, notably in the vicinity of Millaa Millaa, where the rainfall is heavy, the growth of Inkweed, many settlers claim, has been too rapid to allow of extermination by hand pulling or hoeing, causing many areas on which grass seed was sown after the scrub had been felled and burnt off to become so infested that growth of grass was entirely prohibited.

With a view to overcoming this trouble, the Department of Agriculture instituted experiments in control by the application of various poisonous sprays, which were carried out during the present year by Mr. Field Assistant Tarrant, of the Atherton office.

The design of the experiments was as follows:—

1. Roberts' Prickly Pear Poison in strength as supplied.
2. Cooper's Weedicide—1 part to 75 parts water.
3. Cooper's Weedicide—1 part to 50 parts water.
4. Arsenic Pentoxide— $\frac{1}{2}$ lb. to 1 gallon water.
5. Arsenic Pentoxide— $\frac{1}{2}$ lb. to $1\frac{1}{2}$ gallons water.
6. Arsenical solution—1 lb. arsenic and 2 lb. caustic soda to 25 gallons water.
7. Arsenical solution—2 lb. arsenic and 4 lb. caustic soda to 25 gallons water.
8. 2 lb. ferrous sulphate to 1 gallon water.
9. $1\frac{1}{2}$ lb. ferrous sulphate to 1 gallon water.

The cost of the materials were—

Roberts' Prickly Pear Poison, $3\frac{3}{10}$ d. per lb., Wallangarra.

Cooper's Weedicide, 52s. 6d. per 5-gallon drum, Brisbane.

Arsenic Pentoxide, 37s. 4d. per cwt., Brisbane.

Arsenic, 40s. per cwt., Brisbane.

Caustic soda, 40s. per cwt., Brisbane.

Ferrous sulphate, 16s. per cwt., Brisbane.

Roberts' pear poison was applied by a Roberts' pump and atomiser, while the other solutions were applied by a knapsack spray pump. The experiments were conducted on Inkweed of three years' growth and on young Inkweed of about six months' growth. Each plot was designed as one-tenth of an acre, with a width of 12 feet.

Mr. Tarrant reports:—

OLD INKWEED TRIALS.

These were conducted in January at E. Grindie's farm, Moregatta, where the Inkweed was of three years' growth and almost impenetrable. Lines were brushed to facilitate operations and to allow application from each side of the 12-foot strip; each plot took from eighty to ninety minutes to treat, excluding the time required for brushing the lines, which implied a period of two days, approximately to treat an acre. Heavy rains occurred each day during the applications, causing a postponement of Cooper's Weedicide and ferrous sulphate treatments until finer weather prevailed.

Plot (1) Roberts' Pear Poison at full strength.—The plants showed a scorched effect within five minutes of the application, all top growth and roots being dead



PLATE 170.—INKWEED EXPERIMENTS.
P lot treated with Arsenic Solution without effect.



PLATE 171.—YOUNG INKWEED OF UNDER A YEAR'S GROWTH, NOT TREATED.

within three weeks. The poison used was at the rate of 25 gallons, and at a cost of £3 8s. 9d. per acre.

Plot (2) Cooper's Weedicide at 1 part to 75 parts water.—The plants did not show any effect until after three days, when the leaves and small branches were killed; but within three weeks fresh growth was made from the main stems, and several weeks later the plants appeared as vigorous as before the application. The cost of the material was at the rate of 10s. 10d. per acre, with 40 gallons of solution.

Plot (3) Cooper's Weedicide at 1 part to 50 parts water.—The experience here was similar to that in Plot 2, while the cost per acre of the application was 16s. 3d. at the rate of 40 gallons.

Plot (4) Arsenic Pentoxide, $\frac{1}{2}$ lb. to 1 gallon water.—After four days the effect was noted on the foliage, and in five weeks the plants had died down to the ground, but new growth appeared from the roots. The cost of the application was 6s. 8d. per acre at the rate of 40 gallons.



PLATE 172.—SHOWING PLOTS OF INKWEED OF 3 YEARS' GROWTH TREATED IN JANUARY. PHOTO. TAKEN IN JUNE.

Plot in foreground was treated with Roberts' Pear poison which killed the Inkweed. Growth on plot is "Goat Weed." Stump in foreground may be seen in photo. 1 at the top marking end of plot.

Plot (5) Arsenic Pentoxide, $\frac{1}{2}$ lb. to $1\frac{1}{2}$ gallons water.—The experience here was similar to that on Plot 4, except that the action of the spray was much slower. Cost of treatment was 5s. 6d at the rate of 40 gallons per acre.

Plots (6) and (7) Arsenical solutions, and Plots (8) and (9) Ferrous Sulphate solutions.—These applications showed no appreciable effect on the growth.

YOUNG INKWEED TRIALS.

These trials were conducted in May on T. Fraser's farm, Lorenz Creek, where the Inkweed was not of more than six months' growth, and offering no difficulty in applying the treatments. Viewing the effect of the sprays on the older growth in January, an alteration was made in the treatments, in which the results were as follows:—



PLATE 173 — YOUNG INKWEED OF UNDER A YEAR'S GROWTH.



PLATE 174.—INKWEED EXPERIMENTS ON YOUNG INKWEED.

Left.— $\frac{1}{2}$ lb. Arsenic Pentoxide to 1 gallon water.

Right.— $\frac{1}{2}$ lb. Arsenic Pentoxide to $1\frac{1}{2}$ gallon water.

Plot (1) Roberts' Pear Poison, full strength.—Within five minutes after treatment the foliage was all scorched, and within ten days all growth and roots were dead. The cost per acre at an application of 20 gallons was 55s.

Plot (2) Roberts' Pear Poison, half strength.—This treatment took several hours to show any effect, but in twelve days all growth and roots were killed. The cost of the application at 20 gallons was 27s. 6d. per acre.

Plot (3) Arsenic Pentoxide at $\frac{1}{2}$ lb. to 1 gallon water.—No effect was shown on the plants until the third day, but in fourteen days all growth and roots were dead. The cost of the application at 30 gallons per acre was 5s.

Plot (4) Arsenic Pentoxide at $\frac{1}{2}$ lb. to $1\frac{1}{2}$ gallons water.—The effect here was as successful as in Plot (3), but much slower. The cost of the application at 30 gallons per acre was 3s. 4d.



PLATE 175.—THE EFFECT OF ROBERTS' PRICKLY-PEAR POISON ON YOUNG INKWEED.

Full strength to left of board; half strength to right of board.

Dividing line of two plots marked by a line from the board in the foreground and the figure up the hill. Treated in May, photo. taken in June.

Plot (5) Arsenic solution at 2 lb. arsenic and 4 lb. caustic soda to 12 gallons water.—Used at the rate of 30 gallons per acre no effect was noticeable at any time after the application. The time occupied in applying the treatments was at the rate of eight to ten hours per acre.

When the plots were inspected in company with Mr. Tarrant on 10th June it was noted that the plot treated in January with Roberts' Pear Poison, where the old Inkweed had been completely destroyed, showed a heavy growth of Billygoat Weed (*Ageratum conyzoides*). This weed is an annual of late season growth, common to the Tableland, which dies down in the winter and is useful in the maize areas in assisting to burn off the dry cornstalks, an office it may possibly perform to advantage with the dry Inkweed. On old Inkweed, of the applications made, Roberts' Pear Poison, only, appears to be effective, but the cost of £3 8s. 9d. for poison added to that of two days' labour in applying, as well as the brushing of tracks, does not

render it an economical proposition; even if the heavy growth could be killed out at a cheaper rate and burnt off, much the same trouble as on newly felled areas would be faced with the young Inkweed growth when the land was resown with grass seed.

Further trials in heavy Inkweed growth are suggested, in which a gaseous treatment might be more economically effective.

On the young Inkweed growth the cost of the treatment with Arsenic Pentoxide at 5s. 6d. or 6s. 8d. per acre, plus that of labour in applying, is the most reasonable, but it is probably that the treatment would also kill out any grass growth and thus necessitate a reseedling.

Possibly, if the Inkweed were allowed to germinate on the new clearing, and then destroyed by spraying before the grass seed was sown, success might be achieved.



PLATE 176.—ROBERTS' PRICKLY PEAR POISON ON INKWEED OF OVER 3 YEARS' GROWTH.

Plot was a strip 12 feet wide running from the front to the right of tree in the centre to stump on top of the hill. Applied in January, The photo. was taken in June. Inkweed completely killed, but largely hidden by growth of "Goat Weed" which dies off in spring and allows of burning off with the dead Inkweed.

The objective, of course, is to establish grasses on the clearing at the least cost. In the case of young Inkweed, the cost of eradicating by hand must be set against that of spraying perhaps more than once, and also of perhaps reseedling a second time, with subsequent loss of time in getting grasses established. Until further data is obtained in this direction, it would appear that settlers would be well advised to pursue the old method of sowing the grass seed immediately after the burn and eradicating the young Inkweed plants by hand. Should this not be found practicable over the whole area, alternate strips might be given attention which would allow a certain amount of grass to be secured and thus give greater facility for spraying the other strips where the Inkweed had taken possession.

GINGER GROWING IN QUEENSLAND.

By A. E. GIBSON, Senior Instructor in Agriculture.

A good deal of attention has lately been drawn to the cultivation of ginger as a crop which is suited to the soils and climate of Queensland, but it must be remembered that the consumption of ginger within the Commonwealth is comparatively small, but by means of an advertising campaign it could possibly be increased by double the quantity that is imported and consumed at the present time. At the same time, care must be taken to prevent over-production of the locally-grown article.

As regards the importations of ginger in all forms, for the period ending 30th June, 1928, a total of 672½ tons of ginger was imported to the Commonwealth from overseas, chiefly from China. This includes green, dry, and partially and wholly preserved ginger which could be produced in Queensland by the cultivation of approximately 200 acres of land—hence the need of caution is reiterated in regard to ginger production.

Unless the local grower is prepared to accept a price which is in accord with that at which the article can be imported, there appears to be very little hope of replacing the imported article by that produced locally.



PLATE 177.—A HEAVY CROP OF GINGER ON THE SLOPES OF BUDERIM MOUNTAIN.

A visit was recently paid to Buderim Mountain to ascertain what progress was being made in the industry, and it would appear that there is at present a "boom" in the ginger-growing industry. An article on ginger growing at Buderim which was published recently may be largely responsible for this. The article in question stated that "although the markets may fluctuate slightly, growers may expect to receive an average price of approximately £56 per ton." This price is, of course, for large quantities, 9d. per lb. being obtainable for small lots. It may interest growers to learn that green ginger is imported into the Commonwealth and landed at Melbourne at a cost of £32 13s. 4d. per ton c.i.f., or 3½d. per lb. Semi-preserved ginger in syrup is landed in Brisbane at £40 per ton c.i.f., and in regard to this class of ginger it may be stated that in a 2-cwt. cask of partly preserved ginger, not more than 20 lb. would be represented by syrup, and this of a heavy density. Intending growers should consider the position before taking definite steps in the matter.

Ginger growing has occupied the attention of the residents of Buderim Mountain and surrounding districts for many years, and it is known that a present resident of Buderim successfully grew ginger forty years ago. Perhaps one of the most experienced growers at present in that district is Mr. A. J. Burnett, who has been

growing ginger for the past twenty years. This gentleman's property is situated on the western slopes of Buderim Mountain, at Glenmount, and he has approximately an acre under ginger. The soil is a medium clay loam, and is distinct from the typical red volcanic soil usually associated with Buderim Mountain. Ginger, when properly cultivated and fertilised with heavy applications of bone dust, can be produced on the slopes of Buderim Mountain of a quality superior to the ginger imported from China, and with the advantage of being fresher than the imported article. Mr. Burnett states that he has produced up to 5 tons per acre, and that 4 tons is regarded as an ordinary yield under favourable conditions. His practice is to prepare the area well ahead of planting, which should take place in October. The ginger is planted in drills (previously fertilised) spaced 2 feet apart with 9 inches between the sets which are planted at a depth of 3 inches. Plant ginger, which shows signs of growth, or as it is termed "shot" ginger, is preferred for planting purposes. Immediately following on the planting, a heavy mulch of grass is applied to the whole of the area, but not just immediately over the sets. Thus the appearance of a newly planted area is practically a mat of grass to the depth of 2 to 3 inches. It requires approximately 1 ton of plant ginger to plant an acre on the lines advocated.

The object of the mulch is threefold—(a) It retains moisture in the soil, (b) it retards and keeps down weed growths, and (c) it gives an added pungency to the ginger.

Little or no weed growth will appear if the initial preparation of the soil has been thorough, and any such growth can be easily and readily handled.

Green ginger which is required for confectionery purposes needs to be harvested at an earlier period than that which is utilised for drying—jam and chutney and other manufactures—and when harvested for this purpose the yield obtained is only about half that produced when the rhizomes are allowed to mature.

Young ginger is both tender and free from fibre, which is objectionable for preserving purposes.

Ginger intended for plant purposes can be left in the soil until the approach of the planting season, and will then be in a better condition for planting.

Harvesting of matured ginger takes place subsequent to the flowering period and when the tops have dried off. For the lesser matured article it is necessary to lift the crop well ahead of this period, usually in April, when the first flowers put in their appearance. An examination of the hands and rhizomes to ascertain the state of maturity, however, must be the true guide.

Owing to the need for care in lifting the crop the whole operation is one which can only be carried out satisfactorily by hand. This, of course, tends to add to the cost of production, but is at present—and until some machine is perfected which will do the work satisfactorily—unavoidable.

As an adjunct to fruitgrowing and other industries in those districts which have a soil and climate suited for ginger growing, the crop has much to commend it, and provided that growers, as a body, will co-operate with the object of maintaining a high standard of ginger, there should be no reason (when the supply equals the demand) for importations to continue.

The need of caution in the future to prevent over-production, however—as Queensland cannot hope to compete in an export trade—is imperative.

THE DAIRY HEIFER.

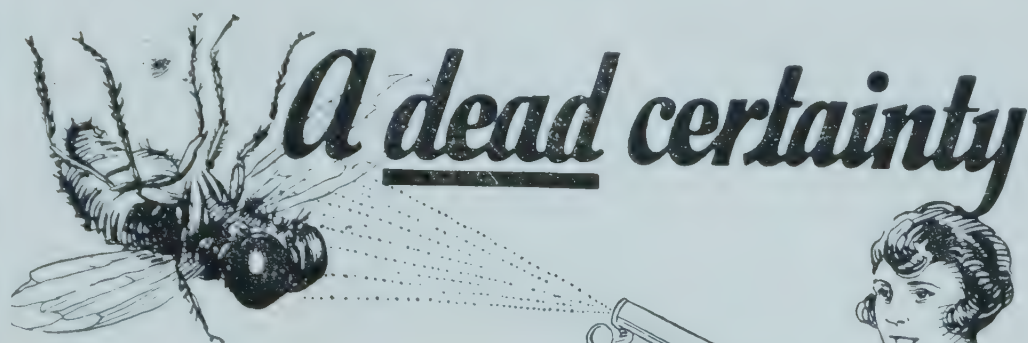
The dairy heifer is a unit of the potential milking herd. The breeder who knows how to grow and handle dairy heifers will add substantially to his achievement with his dairy herd.

The demand for reproduction and milk production are so heavy on high-producing dairy females that every opportunity must be given for growth and development before the animal begins her lactation period.

Improper feeding and breeding at too early an age are two factors to avoid.

The time to take advantage of the growth impulse is when it is most potent, and when demands for milk production do not interfere with its influence.

Do not allow the dairy heifer to get a setback by turning on to scant pasturage or by improper feeding.—C. F. McGRATH, Supervisor of Dairying.



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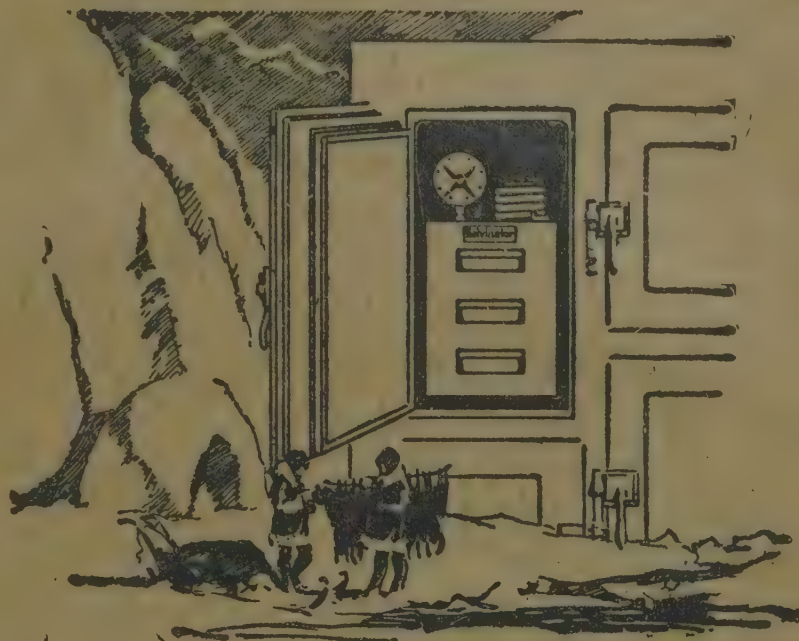
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THE CONSTRUCTION OF MOTOR TYRES. ENSURING GOOD SERVICE AND DURABILITY.

By RADIATOR.*

Fabric or canvas consists of interlaced cotton strands known as warp and weft; the warp being the longitudinal strands, and the weft the cross strands. When fabric is used as the base for a motor tyre, considerable friction is caused in these interlaced cotton strands.

Consider a tyre rotating as the car moves. The portion of the tyre touching the ground is slightly flattened. This flat portion keeps on moving around the tyre as the wheel rotates. The result is that every portion of the circumference is pressed in slightly and allowed to expand again once for each revolution of the wheel. The degree to which the tyre is inflated, of course, affects the extent by which the tyre is flattened; naturally balloon tyres are flattened much more than high-pressure tyres. This constant flexing of the tyres naturally causes internal friction in the tyre.

In the case of the fabric tyre the constant flexing causes the interlaced strands to rub the one against the other, and as well as generating a lot of heat by friction, the strands also chafe. The heat generated causes the rubber to over-vulcanise and so become rotten. On account of these defects the fabric tyre is only suited for high pressures where the amount of flexing is extremely small.

The cord tyre overcomes the defects of the fabric tyre as follows:—There being only longitudinal cords in each ply, the friction between interlaced strands is entirely removed. Also the cord tyre provides a ready means of surrounding each cord with rubber which takes up the flexing without generating any heat or any chafing.

The comparison between the two tyres will be better understood when the construction of the tyres has been explained.

After the cotton cords have been cleaned at the tyre factory, they are impregnated with the very best of rubber; this means that each cord is surrounded with a film of rubber that will act as a cushion when the tyre is flexed. The process of impregnating the cords is known as "proofing."

In the case of fabric, the material is spread with a coating of rubber, but it is obviously difficult to separate each strand from its neighbour in the fabric.

The tread is always of hard rubber, and is placed on the tyre in various ways by different manufacturers. Sometimes the tread is extruded complete in one piece, and placed upon the tyre, whereas other treads are made up in layers. The tread is arranged so that the periphery has the thickest rubber, while the edges taper away to nothing.

In the single cord process, the whole tyre (including the tread) is vulcanised together. This method produces a satisfactory tyre, but the objection is that any flaw in the vulcanising of the casing will be undetected.

In the double cord process the casing is vulcanised in one operation, and the tread is vulcanised on in the second operation.

The vulcanising takes place in a metal mould. It is in this process that the various designs of tread are imprinted on the outside. While in the mould the whole tyre is heated with steam and at the same time subjected to an enormous hydraulic pressure (about 2,000 lb. to the square inch). This vulcanising process causes the whole tyre to weld together into one mass, and if the vulcanising has been a thorough success there should be no blisters in the rubber.

This description of the manufacture of tyres will probably explain to the reader why tyres are so expensive. Although the making of tyres is a scientific process, the reader must not think that good tyres cannot be made in Australia. Good tyres have, and are, being made in Australian factories. The raw material is, of course, imported, but it is hoped that in the near future Queensland will provide the necessary cotton at least.

The development of tyres has probably contributed most, in the last fifteen years, to the progress of motoring. In 1913 it was quite possible to procure a reliable car, but the tyres of that time were certainly a worry. Punctures and blow-outs were extremely numerous, and the motorist who made a 200-mile trip without tyre trouble was more fortunate than the one to-day who does 2,000 miles without trouble.

*In the "Farmer and Settler."

To conclude this article a few words about the preservation of tyres will probably be in season. The following points should always be adhered to:—

- (1) Keep the tyres inflated to the correct pressure; an air pressure gauge is an essential accessory.
- (2) Never run on a flat tyre, even for a short distance. It is far better to remove the tyre and run on the bare rim.
- (3) Keep the tyres and tubes free from grease and oil, as these two destroy rubber.
- (4) Make sure that the wheels are always correctly aligned. To run a car with the front wheels badly out of alignment will mean that the tyres will be ruined in a hundred miles. Even a little inaccuracy in alignment greatly shortens the life of the tyres.
- (5) Always keep the brakes equally adjusted and capable of being easily applied.
- (6) Drive carefully. This last item is the most important of all. Never accelerate or brake suddenly, do not skid around corners, and never take a corner more sharply than necessary. Do not race uphill in gear. Every time that the wheels bounce off the ground they race and tear off a piece of rubber as soon as they again touch the ground.

If the tyres are well cared for, and the car carefully driven, the tyre life will be double that obtained if the tyres are not considered. Having regard to the price of tyres, the care is well worth while.

BREEDING AND SELECTION OF DAIRY STOCK.

By C. F. McGRATH, Supervisor of Dairying.

The industry needs better cows, and the dairy farmers and breeders must breed and rear the better cows, because they do not now exist to the extent required.

The foundation of the dairying industry for the future must be laid now in the breeding and rearing of high-class dairy stock.

That this work can be done with the degree of success its importance demands is evidenced by the success attained by many breeders of high-class dairy stock in this and other States of the Commonwealth.

Breeds of dairy cattle have been in existence for many years past, but the stud master of to-day breeds on dairy lines by selecting and mating animals whose parentage have high production records.

Pedigrees alone do not indicate the quality of milk and butter fat that a cow will produce. Such characteristics are the animal's heritage, and by careful dairying Nature's gift to her can be developed to its full capacity.

A successful stud master knows that a certificate of registry in a herd book is not evidence of high dairy production, and he realises that selection is not confined to pedigree. Attention is given to the constitution, production, conformation, and general characteristics of the animals selected from which to breed.

It is important that the constitution be sound, and this is indicated by large, well-developed lungs and a broad and deep chest. A sound state of digestive organs is important and has a great influence on all the functions of the body, and more especially on the secretion of milk.

Dairy type and conformation are readily discernible by the trained eye of the stock breeder. An animal of the desired type and character attracts and fills his eye and is then subjected to a close examination for the points and characteristics essential in good dairy animals.

A knowledge of the development of dairy qualities in cattle is a valuable aid in the selection and breeding of dairy stock.

The development of dairy qualities in the female begins by exciting the udder to unnatural activity by stripping it at frequent and regular intervals of all the milk secreted.

Care in handling and proper feeding are essential to produce high-quality dairy animals, and if supplemented with a sound knowledge of selection and breeding the desired characteristics will be transmitted to the offspring.

Such prepotency is to be obtained by line dairy breeding rather than by simply breed breeding.

Breeding.

A great deal has been written on breeding, and many breeders have contributed to the literature on the subject and quote pedigrees and discuss high-class animals that have been inbred. Such results invariably reflect the intelligence of an experienced stud master.

Disastrous results have invariably followed inbreeding of dairy stock when practised by the inexperienced stock breeder, as is evidenced by the numbers of nondescript animals to be seen in many districts.

There are several methods of breeding, as practised by stud masters—viz., inbreeding, line breeding within distinct families, line breeding with distant strains of the same blood, and outcrossing, which is the continued introduction of fresh blood.

Inbreeding is the practice of mating closely related animals such as sire to daughter, son to dam, brother to sister.

It is considered that an animal is inbred when its parents have 50 per cent. or more of common ancestry in the pedigree.

The purpose of inbreeding is to fix or intensify desirable characteristics or qualities in animals so that they will more consistently transmit such characters to their offspring.

Many high-class flocks of sheep, herds of cattle, and breeds of horses have been established by inbreeding.

Such successes have been achieved by stock breeders who possessed an intimate knowledge of the breeding and general characteristics of the animals mated, a natural aptitude for their work, and the gift of observing the good and bad points of the selected animals.

The problem confronting the stud breeders is to choose animals that possess outstanding desired characters and to eliminate from the breeding operations those animals which possess undesirable characters. Skilful selection of the animals to be mated is the all-important factor in purifying the hereditary make-up of the individual in a herd, and for intensifying type and breed characteristics that will ensure that the offspring will inherit the character of the parents, to a degree equal to or better than their parents.

Line Breeding.

Line breeding may be differentiated from inbreeding as defining it as the mating of two animals identical to the extent of 25 per cent. and less than 50 per cent. of their blood. Line breeding is a popular practice with breeders, as it is not accompanied with so great a risk of reproducing and fixing undesirable characters as is associated with inbreeding.

Line breeding within proved strains of blood is a safe method for breeders desirous of improving their herds. The system widens the opportunities of selecting animals with desired characteristics.

Out Crossing.

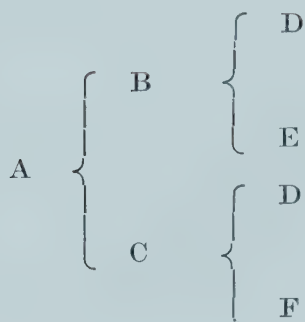
Outcrossing is the mixing of strains of blood within one breed by mating animals entirely unrelated or having less than 25 per cent. of common ancestry entailing a continuous change of blood.

This method of breeding is frequently disappointing unless controlled by an experienced breeder. Ability to select sires with the characteristics necessary to maintain or improve the standard of the herd to which he is mated is essential, otherwise the more fresh blood that is introduced the more uneven in character will the herd become, though a few high-class animals may be bred.

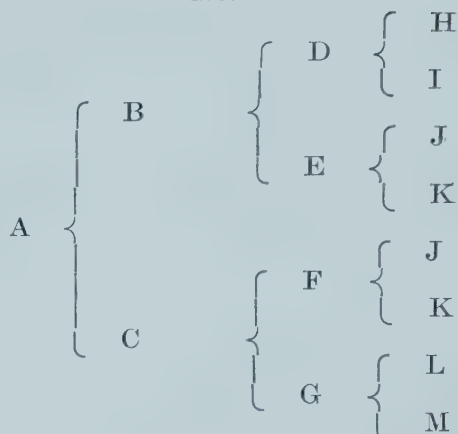
A study of Mendel's laws of heredity will enable the breeder to readily understand why the outcrossing method is often unsuccessful and misleading to the young and inexperienced breeder of live stock. The pedigrees tabulated below clearly indicate the difference in the methods of breeding.

INBREEDING.

No. 1.



No. 2.

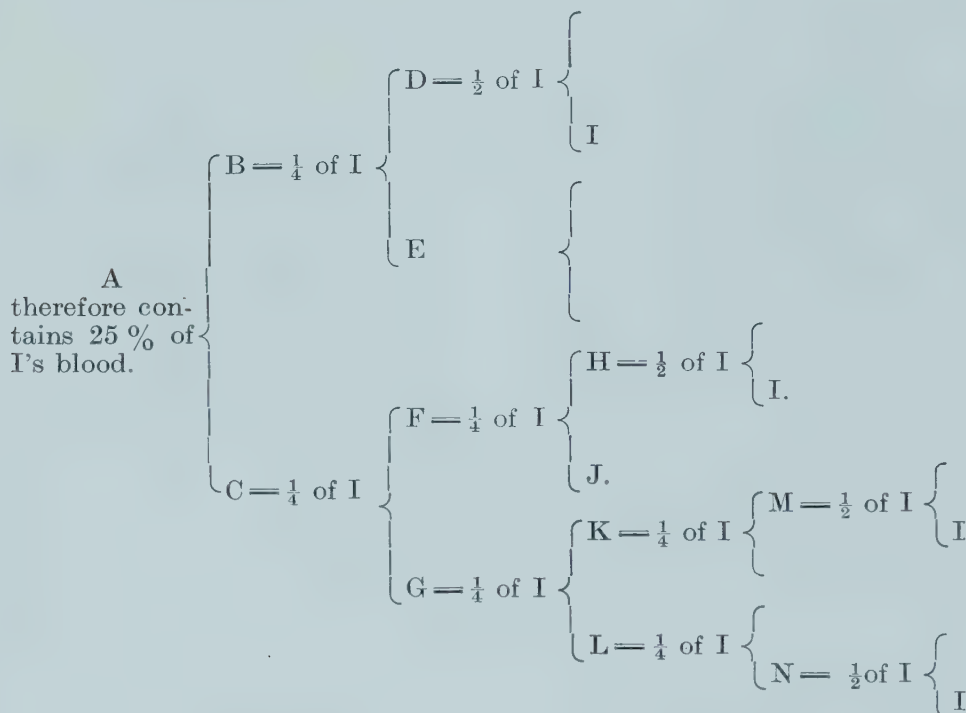


No. 1 tabulation indicates that A is inbred as son and daughter of sire D are mated.

No. 2 tabulated example indicates that E the dam of B (sire) and F the sire of C are full brother and sister, so that B and C the sire and dam of A are first cousins in blood.

LINE BREEDING.

No. 3.



No. 3 tabulation indicates that A has been line bred to dam I. The dam G having two lines of blood to I has been mated with F, whose sire H is a son of I, and the progeny C has been bred to the sire B who is a grandson of I.

In this case line breeding with distant strains of the blood of dam I has been carried out, and there has been sufficient latitude to allow faults to be eliminated and desired characteristics to be fixed by selection.

By this method desired individual characteristics of animals can be retained or intensified in the progeny.

The breeder should make up his mind as to the breed he considers most suitable and which he desires to establish, and then select the foundation stock from breeders whose stock come nearest to his ideal.

A keen observation of the animals he is breeding will enable him to cull his herd and select sires to fix type and character which are essential to success. Sound judgment in selection and mating and judicious feeding are necessary in the successful establishment of a profitable dairy herd.

THE GROS MICHEL BANANA IN NORTH QUEENSLAND.

W. J. ROSS, Assistant Instructor in Fruit Culture.

Notwithstanding the Gros Michel banana (known also as the "Fijian," "Jamaican," &c.) has been grown in a limited way for a number of years in North Queensland, there are many people who are not acquainted with its characteristics and excellent qualities, much less its requirements from the cultural standpoint. Tests conducted some time ago and followed by observation extending over a long period have established its value as a commercial fruit, and also the suitability of many localities in different parts of the North for its successful cultivation. Its claim for attention, as regards the growing of it on a much greater scale than hitherto, is now being recognised as evidenced by the number of applications for plants received by those in the position to supply.



PLATE 178.—FINE HAND OF GROS MICHEL BANANAS, SHOWING LENGTH OF FRUIT.

The intention of this article is to submit to the readers of the Journal a few observations, together with illustrations, which might be of interest if not of useful guidance to those contemplating entry into this branch of fruit production.

Characteristics.

Conspicuous among its characteristics when compared with the Cavendish variety are:—Its tall growing habit, often attaining a height of 30 feet from the ground to the tip of the uppermost leaves; strong growth, having stems 4 feet and more in circumference at the base; open structure of the bunches, affording more room for the development of the fingers or individual fruits which are usually very large and less curved than the Cavendish; and, lastly, what may be regarded as its most desirable characteristic, the thickness and toughness of the skin of the fruit which renders it capable of withstanding to a greater degree the ordeal of reaching distant markets in a more saleable condition than is the case with Cavendish.

Importation of Plants from Fiji.

It was this variety that popularised the trade between Fiji and Australia in the past, to the detriment of our Northern industry, which was almost wholly confined to the growing of the Cavendish variety. In order to frustrate as far as possible the increasing popularity of the Fijian banana on the Southern markets in those days, the Mourilyan Syndicate and also the Department of Agriculture and Stock imported into this State, during the years 1909 to 1912, a quantity of Gros Michel plants which were to be the foundation stock from whence supplies of plants could be distributed as required. A propagating area was established at the Kamerunga State Nursery (long since closed), and from this institution plants



PLATE 179.—PORTION OF PLANTATION OF GROS MICHEL BANANAS, 12 MONTHS AFTER PLANTING.

were sent long distances. The accompanying illustrations, taken quite recently on Mr. P. Monaghan's plantation at Kennedy, depict the progeny of the original imported plants, some of which were sent to the Cardwell district.

"Panama Disease."

It is generally recorded that the Gros Michel is subject to attack by what is called "Panama Disease" (*Fusarium cubense*), a very serious malady in countries where this variety is extensively grown; but it is noteworthy that during the time this banana has been grown in parts of North Queensland, continuously since 1910,

no serious symptoms of disease other than those associated with Cavendish have been recorded. On Mr. Monaghan's property, as well as in other plantations in the Cardwell district where this variety is grown, there are no apparent indications of the presence of "Panama."

Limitation of Growth.

It may be asked, why this banana was not more freely grown by the Chinese growers in the north years ago. The answer is, firstly, that it was not until it was too late to stop the decline of the Northern industry, that importations of plants were made. Secondly, the expansion of the sugar industry and the keen competition for the class of land which was favoured by the Chinese for the growing of bananas were then taking place. Further, the amended Land Act, restricting the ownership



PLATE 180.—GROS MICHEL BANANAS. SHOWING HEIGHT
AT WHICH BUNCHES ARE BORNE.

of land to not more than 5 acres in the cases of unnaturalised Chinese—together with the growing popularity of Fijian fruit on the Southern markets and consequent poor returns to Northern growers—assisted to deter the opening up of new plantations in areas not immediately required for sugar and where facilities for transport were available. Again, the Cavendish or Chinese banana, as it is sometimes called, had in the latter sense of the term, an attraction for Chinamen, Chinese growers were disinclined to change over from the growing of the Cavendish variety.

The reason why it is not grown in the Southern districts is due to the fact that it requires a tropical climate and well-sheltered locations. It would be slower to grow and mature its fruit than the Cavendish if grown in Southern districts where the latter succeed.

Directions for Planting.

When planted in congenial locations fruit from the Gros Michel are ready for market in from twelve to thirteen months after planting. The plants should not be set out any closer than 15 feet apart each way. Select a well-sheltered location, preferably flat land rich in humus, for the plantation. Basin flats with high surrounding banks, such as are found contiguous to rivers and creeks, are ideal if not subjected to too severe flooding. Shelter afforded by ranges of hills, or by leaving heavy belts of scrub surrounding the area to be planted is also to be considered.

Choose club-shaped plants, i.e., those tapering to a sharp point at the apex and having large butts. The depth at which plants are placed in the ground is governed by the size of the plants used; but if allowance is made when digging holes to admit of there being a basin from 4 to 6 inches deep left around the plant after the corm has been covered by 3 or 4 inches of soil, the operation will have been satisfactorily performed. The basin left around the plant will fill in during the course of later cultivation, which consists mainly in suppressing weed growth and retaining a good soil mulch to aid conservation of moisture.

On account of the height at which the bunches of the Gros Michel are borne, some difficulty might be experienced at the time of harvesting. The method usually practised is to make a V-shaped cut about three parts through the stem of the plant and on the same side as the bunch is hanging. The head of the plant with the bunch gradually falls over, and it may be further steadied by placing a forked stick under the stem and lowering as required until the bunch can be handled and severed from the plant. The bunches are then treated with the utmost care, while all subsequent operations such as dehanding, sweating, grading, and packing are carried out in as careful and thorough manner as possible.

WEEDS OF QUEENSLAND.

By C. T. WHITE, Government Botanist.

BUTTON WEED OR BUTTON MALLOW (*Modiola caroliniana*).

Description.—A weed of one or several years' duration, the stems freely branched and procumbent or more or less ascending, 6-18 inches long, stems and leaves covered with scattered hairs. Leaves orbicular in outline but much cut and divided, mostly about 1-1½ inches across, on slender stalks of up to 2½ inches in the lower leaves. Flowers solitary in the leaf axils, on slender stalks of about the same length or longer than the leaf-stalks; spreading flat, about ½ inch across. Petals 5, red. Fruits composed of about 20 carpels, the carpels blackish when ripe and clothed on the back in the upper part with rather long bristly hairs.

Distribution.—A native of Central America, the West Indies, and the warmer parts of South America and the United States, now widely spread in other parts of the world as a naturalised weed.

Common Names.—Button Weed, Button Mallow, Red Mallow, Bristly-fruited Mallow, and Creeping Mallow are names variously applied to it.

Botanical Name.—*Modiola* from Latin *Modiolus* (dim. of *modius*, Gr. *modius*) the Roman corn measure, the fruit shaped like a bushel measure; *caroliniana*, a native of Carolina, U.S.A.

Properties.—Like other members of the Mallow family it no doubt has some value as a fodder.

Eradication.—The plant is not a particularly aggressive weed in Queensland. Cutting off well below the surface of the ground is sufficient. If any part of the crown is left it shoots up numerous strong wiry stems.

Botanical Reference.—*Modiola caroliniana* (L.) G. Don. Gen. Hist., Pl. 1, 466, 1831. *Modiola multifida* Moench, Melh. 620.

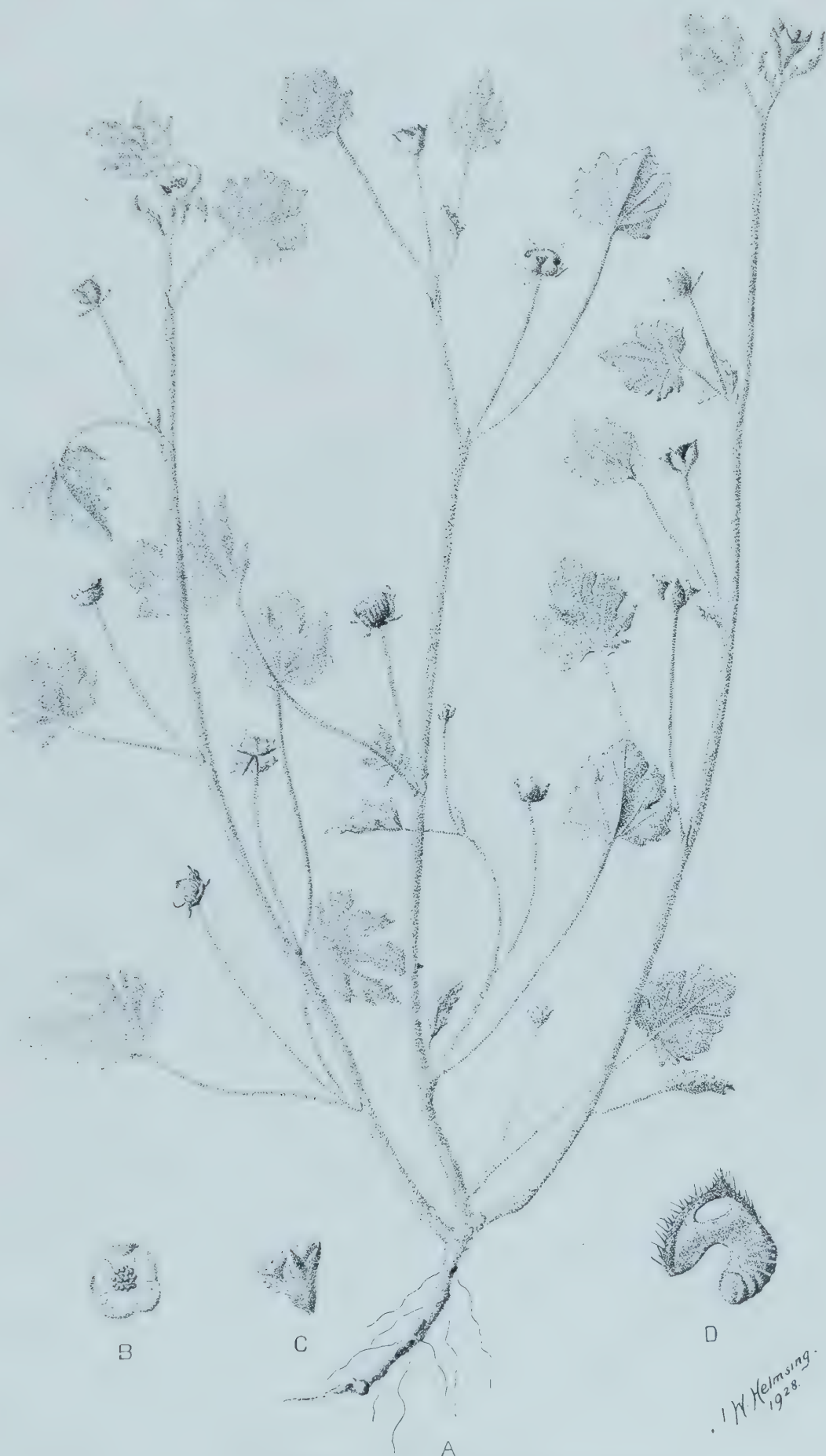


PLATE 181.—BUTTON WEED (*Modiola caroliniana*).

- A. Plant about half natural size.
- B. Single flower (face view).
- C. Single flower (back view).
- D. Ripe carpel containing seeds.

PIG TRANSPORT.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

The transport of stud pigs by horse-drawn or motor vehicle or by rail or steamer requires that they be comfortably accommodated in roomy crates, provided with ready means of entrance and exit and with a convenient food trough. The accompanying illustration serves to convey to the reader the care exercised and the provision made by Queensland State Farms and other Government institutions in the crating of stud pigs for transport purposes to all parts of the State.

The excellent condition on arrival that is frequently specially mentioned by purchasers of stock from these farms, and the absence of any loss in transit is a testimony in itself to the methods adopted. It will be noted that large airy crates are built, fitted with sliding entrance door and roomy feed trough; the crate is covered with sound bagging protection for tropical conditions—a special feature where stock have often to remain in the open at wayside stations or be conveyed to the farm some miles distant.

It will also be noted that the crates are suitably stencilled with the particulars of the stock and the breeder's name and address, thus presenting a neat and attractive consignment which in itself cannot fail to attract attention.



PLATE 182 (Fig 1).—A STACK OF PIG CRATES READY FOR DESPATCH.

Attention to all matters of detail counts much for success in matters associated with the breeding and sale of stud stock. The successful men are the ones to whom all this detail is a pleasure as well as a business. Nothing pleases a buyer more than to have his purchases arrive in an attractive condition, for the arrival of fresh stud stock invariably creates considerable interest among the farming community. The farmer who receives a stud boar or sow in good order and condition in a neat, attractive, stencilled crate, and who can take the pig's pedigree from his pocket-book and exhibit it for the benefit of his neighbours, is certainly doing not only himself but his district a good turn, for much depends upon the success of such purchases. If they are a success good business results; if they are a failure the stud pig business receives a rather hard bump.

It is up to breeders, therefore, to see to it that their stud stock go out to buyers in convenient, roomy utility crates—crates that can be made use of for other purposes than for the mere transport of pigs from station to station or from farm to farm.

Full details as to the size of crates, their approximate cost, &c., can be supplied on application to the Department of Agriculture and Stock, Brisbane.

Speedy Return of Crates.

Breeders should pay strict attention to the immediate return to vendors of crates used in the transport of breeding stock, for, unless this matter receives immediate attention, vendors are placed at a considerable disadvantage and are compelled to have a larger supply of crates than would be necessary if their crates were returned immediately after use.

To the breeder despatching only one or two pigs each month or quarter, this may not appear to be an important item, but to the breeders of stud stock, who carry on business on a large scale, it is an exceedingly urgent matter and one that should not be lost sight of in these transactions.

As the stud pig business is developing rapidly and as more stud pigs are now being handled than ever before, the crate problem becomes a more important one and one which causes many breeders great concern. If it cannot be arranged that the crates be returned immediately, purchasers should inform vendors by letter so that they will not be making unnecessary journeys to the local railing station in search of returned crates.

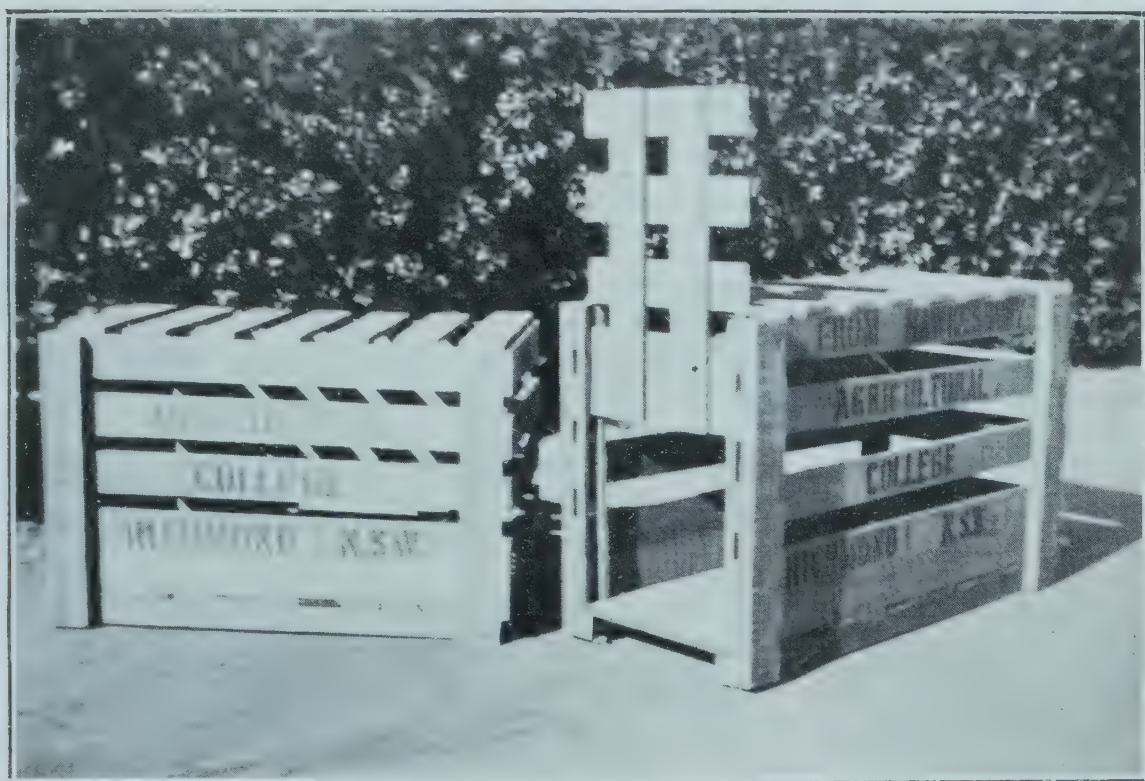


PLATE 183 (Fig. 2).—THE TYPE OF PIG CRATE RECOMMENDED FOR USE IN THE TRANSPORT OF PIGS PER RAIL, ROAD, OR STEAMER.

Note style of door and attractive stencil of breeder's name and address. The trough does not show in this illustration.

Bacon factories, which receive a few pigs in crates, are always prompt in attending to the return of the "empties," otherwise their business would be checked.

It is equally urgent that, when purchasers do return crates, they should inform vendors by letter, so they will be on the lookout for the crates. It is worthy of consideration that sales of stud pigs should be on a basis of delivery in crate on rail, free of all charges at purchaser's station. Such a system would save endless worry and annoyance. In actual practice, it is quite possible and satisfactory.

Crates Should be Kept Clean.

Stud pig-breeders should be careful to thoroughly disinfect crates prior to despatch of stud pigs, and to be especially careful to redisinfect them again on arrival at the home farm. This is necessary by reason of the fact that hog lice, the most prolific and persistent of the external parasites of the pig, breed not

only on the pig's body, but also in cracks and crevices in the sties, roofing and partitions, as well as in pig crates, especially those that have been used for the conveyance of pigs that were infested with these parasites.

Complaints have been made on several occasions of specially selected stud pigs arriving at their destination "smothered in lice." Nothing is more disgusting to the purchaser and the enthusiastic beginners in the business than to receive specially selected valuable animals in such a condition. In fact, it gives the breeder a considerable set back, and, incidentally, paves the way for the introduction on to what is probably a clean farm of a host of parasites, which rapidly accommodate themselves and, in the course of a few hours, are breeding and thus increase their numbers. Frequently when the animals left the vendor's farm they were crated and guaranteed free from lice, though the vendors quite forgot to examine the old empty crates, which were used in despatching stud pigs. Such carelessness causes a great deal of harm to the vendor as well as to the industry as a whole.

Food Troughs in Pig Crates.

It is absolutely essential that breeders should provide a suitable food trough in all crates used for the transport of pigs by rail, road, or steamer. The food trough should be constructed so that it is capable of being used also as a water-trough. It is a decided advantage, too, where railway regulations permit, to provide some form of bedding in the crate, even if it is only clean, dry sawdust or moist sand. It will be argued, of course, that the latter would considerably increase the weight of the consignment, but generally the freight charges on crates are rated on a measurement, and not a weight basis. This is particularly so in large crates where the weight by measurement is invariably greater than if the crates were actually weighed.

In connection with the food-trough, it is suggested where the pigs are to be forwarded over long distances, that a supply of food (pollard and bran in equal parts preferably) should be placed in a sugar-bag and tied to the crate in such a way as to be readily accessible for use as required. A note attached to the waybill, asking that the food be mixed with water and given to the pig or pigs at certain specified stations, is also suggested.

The use of a stiff label attached to the crate, asking that the animals be given food and water, invariably results in attention being given as required.

Prompt Advice re Despatch.

Prompt advice concerning the despatch of this class of consignment is essential. Delay and annoyance is possible and additional risk is incurred. It is advisable to forward a telegram or letter, which insures as far as is humanly possible, satisfaction to both parties.

Freight Charges.

In cases where it is necessary to prepay freight, it is advisable to add the approximate amount to the price quoted for the animal and to effect the sale on a F.O.R. (free on rails) destination basis in preference to a F.O.R. sender's station rate. Delivery at destination is suggested in order to avoid the necessity of collecting freight after delivery has been given. If the purchaser's station is one at which permanent officials are stationed, freight may be charged and collected by the officials before delivery is given.

It would be a much better proposition if stud pig-breeders generally would quote for their stock on a cash with order basis, delivery to be given in crate at purchaser's station, all charges paid to that station. Many breeders will, of course, consider this quite an impossible proposition, but it has been found from experience that once the system is a practice and is explained to purchasers, it is superior to the return of crate method, which will always prove to be an unsatisfactory scheme.

Protective Covering over Crates.

Reference is made in the description of crates illustrated in Fig. 1 to the advisability of providing a hessian cloth cover over the top of the crates to ensure at least some protection from the rays of the sun, whilst the crates are awaiting delivery at senders' or purchasers' stations. This need not be an expensive item. An old chaff bag would be better than no covering at all.

Doors at Both Ends of Crate.

In crates used for the transport of mature stock or for large animals, it is a decided advantage to have a movable door at each end of the crate and to have this door effaced in such a manner that, when the "catch" or "pin" is released, the door may be readily lifted out to permit of the free ingress or egress of the animal. Such movable doors are not difficult to construct and are a decided advantage. Their addition need not necessarily increase the value of the crate very much. It is an advantage, too, where possible, to provide suitable handles at each end of the crate to allow of the crate being more readily moved about. For preference, these handles should be arranged so that they are movable, and may be turned down out of the way when crates are being packed in trucks.

Side Boards.

It is advisable that the lowest board on the side of the crate be at least 6 inches in width and that it be nailed or bolted close to the flooring boards. Where these lower boards are above the flooring, even if only 1 or 2 inches, the pigs' feet are liable to become injured by being forced through to the outer edge and becoming "jammed" if the crate is bumped or knocked about. Where boarding is used in the crate it is a decided advantage in ensuring that the bedding is not forced out of the crate.

Legs on Shipping Crates.

Most coastal, interstate, and overseas shipping companies require that shipping crates be provided with stout legs permitting of an open space of at least 4, and in some instance 6 inches underneath the crate. It would be advisable for breeders or their agents, who are concerned in the shipment of pigs in crates, to ascertain the regulations before arranging the delivery of the pigs at the wharf. The railway regulations governing consignments may be ascertained on application to any station-master, from whom consignors will receive every courtesy and assistance.

"THE FARM PRODUCE AGENTS ACTS, 1917 to 1928."

The first Farm Produce Agents Act was passed in 1917, the objective being to ensure supervision over farm produce agents in their dealings with those for whom they were acting as selling agents. It was found that this Act did not meet all requirements, and, with a view to remedying defects and to render its administration more effective, the Minister for Agriculture and Stock (Hon. W. Forgan Smith), during the last session of Parliament, introduced an amending Bill. This measure was passed through all stages, and has now received the Royal assent.

The chief amendments relate to the keeping of trust accounts by agents, the prescribing of the books and records of transactions and their inspection by authorised persons, and the payment to principals of the proceeds of sales within a given period.

It is provided that all moneys received by an agent in respect of the sale of produce on behalf of a client shall be paid into a special trust account called the "Farm Produce Account." The Department of Agriculture is to be notified of the name of the bank in which this trust account is kept, while production of the pass-book relating to the account can be demanded. Money paid into the trust account is protected and is not available for the payment of any other creditor.

An important clause is that which requires the principal to be paid within thirty days of the date of sale of the farm produce. There is nothing in the Act to prevent the agent paying his client as early as he pleases, but he must not delay payment beyond thirty days.

Power is given to prescribe the books and records of transactions which are to be kept by agents. Books, including the pass-book of the trust account, must not be destroyed for at least twelve months from the date of the last entry therein. The Department has power to inspect these books and records with a view to seeing that the law is being carried out or to investigate the complaint of an aggrieved party to whom the Minister will have power to communicate the result of such inquiry.

The rendering of fraudulent account sales will make an agent liable to imprisonment for three years, or a penalty not exceeding £100.

The destruction by an agent of any farm produce which is in a marketable condition is an offence under the Act.

Where any offence against any of the provisions of this Act is committed by a corporation or joint stock company, the chairman of directors or manager or other governing officer is liable to the punishment provided unless he proves that the offence was committed without his knowledge or connivance and without any negligence on his part.

An applicant for a license must satisfy the licensing court that he is a fit and proper person to hold a license. He must notify the Department of the address of his registered office, and affix a sign on his premises bearing the words "Licensed Farm Produce Agent." The fixation of commission charges has been left in the hands of the Board of Trade and Arbitration. There is nothing in the Act to which any straightforward agent will take exception, nor is there any provision which will in any way curtail the full exercise of their functions as farm produce agents. Most of the agents are carrying on their business satisfactorily, and the amendments to the Act will cause them no concern.

The Act now embodies all features which the administration of the original Act has shown to be necessary or advantageous.

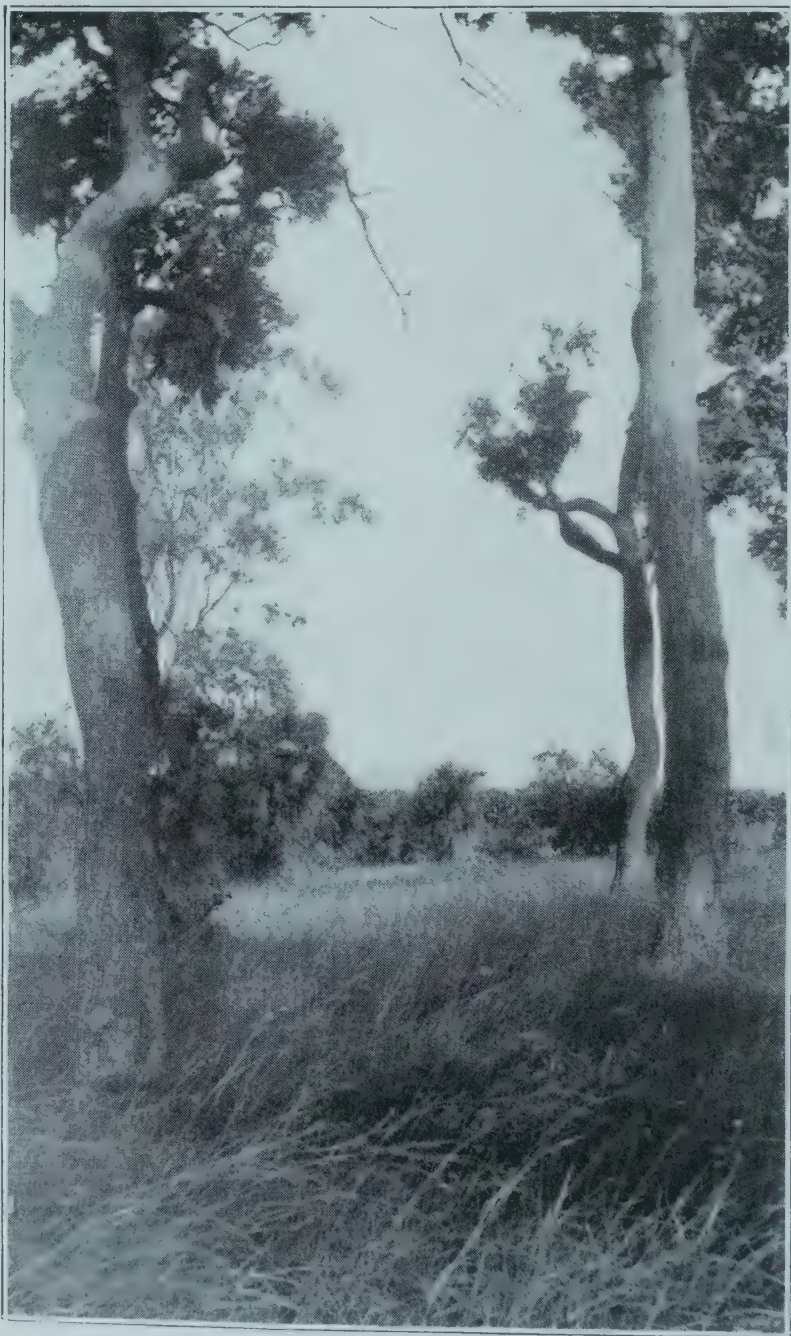


Photo.: Miss J. Easton.]

PLATE 184.—IN THE SHADE OF THE OLD APPLE TREES. SCENE ON COOCHIN COOCHIN STATION, NEAR BOONAH. MOUNT EDWARDS IN THE CENTRAL DISTANCE.

MILKING BY HAND.

By PRIMROSE McCONNELL.*

Nine years ago, under the "Dairy Farmers' Notes" heading, an article on hand milking was published in the "New Zealand Farmer," but quite lately there have been repeated requests for advice on this very important matter, hence the present article.

While it is true that the milking machine has come to stay, and that it does excellent work under careful management, there are still circumstances under which hand milking is preferable to the machine, not to mention the fact that machines occasionally break down and the human hands have to take their place for the time being.

It seems to be the general opinion that dairy farms will become smaller as time goes on, and if this opinion proves to be correct, hand milking may become a great deal more common than it is at the present day. On a small farm, where the farmer possesses, as a rule, a proportionately small capital, it has to be seriously considered whether the outlay on a complete milking plant is justified, or profitable, and the labour required to keep a small plant thoroughly clean is almost as great as that in connection with a larger one. One man will easily milk a small herd of, say, twelve cows by hand, and the only utensils required in the milking shed are a milking pail and a larger carrying can, the cost of which is a mere trifle, as is also the cost of keeping it in repair.

Further, there is no doubt that, although a well-handled milking plant does good work, and is a present-day necessity in larger herds, it is not as efficient as the best hand milking; no record-breaking cows are ever milked by machinery. On the other hand, a bad hand milker is worse than a second-class milking machine badly handled.

Hand milking is an art and requires undivided attention, energy, and knack. Women, as a rule, make the best hand milkers, as their hands are small and soft.

Putting the Cow in a Good Humour.

There are several things which have a direct bearing on successful milking, besides skilled manipulation of the hands, and the principal thing is to put the cow in a good humour for the operation. This is accomplished by gentle handling from the time the cows are being driven to the milking shed until they leave it after milking.

A herd of cows should be taught to come when called on and not be rushed with dog and stockwhip. A gentle pat and a kindly word have quite the opposite effect to a growl and a blow before the milker sits down to his work.

Various Systems of Hand Milking.

The first part of the operation, whether the milking is done by hand or machine, is to thoroughly wipe the udder and flank with a damp, clean cloth wrung from some germicide solution; then draw a stream or two from each teat on to the floor or into a small tin containing a strong solution of crude carbolic acid. The object of the latter operation is twofold—namely, the ejection of any germs that may have gained admittance to the outlet of the teats, and to discover whether there is any sign of mammitis. The little milk that is ejected is almost valueless in any case, as it is always very watery and contains little or no fat.

The udders of heavy milkers are often tender, and for this reason the milking should be commenced very gently, always keeping in mind that gentle handling promotes the flow of milk. On the other hand, if the cow is excited through any cause, the reflex nervous action causes the tissues of the udder to shrink, and the milk is held up.

The position of the milker when sitting should be as close to the cow as possible, with his or her head pressed lightly against the flank. Many milkers sit too far away from the cow, and are neither in a position to control her movements, or to manipulate the teats in a proper manner.

When the milker is sitting in a correct position, if the cow has the habit of lifting her leg, the action may be stopped to a great extent, by pressing the arm against the hollow of the hock.

Some milkers milk with dry hands, and others with wet, and I have seen good milking done either way, but the ever-increasing demands of sanitation will soon make wet milking a thing of the past; for my own part, I think it is a filthy habit. It is

* In the "New Zealand Farmer" for August.

too well known that comparatively few hand milkers wash their hands during milking, yet, every now and again, the dirty fingers are moistened in the contents of the milk pail. Is such a habit commendable? A good, dry-hand milker never unduly stretches the teats, but the wet-hand milker almost invariably does.

As previously stated, the initial manipulation should be gentle, and the pressure of the hands gradually increased, until the flow of milk reaches its height. Some quite good milkers milk a fore and hind teat together, but it is better to commence with the two fore teats, with the object of developing the forequarters, which are generally smaller than the hind. So far as efficiency of milking is concerned, it does not really matter which way is adopted, as long as the method is the same day after day. When the cow has filled her teats with milk, the action of the milker should be fairly vigorous. The pressure should be upwards, against the floor of the udder, so as to resemble the sucking of the calf as much as possible, and the teats should not be let go until the quarters are empty. A thoroughly efficient, dry-hand milker will never use a finger and thumb, even in stripping out. Whether he gets two, three, or four fingers on the teats, will depend on their size, but in any case, he will hold on to the end without resorting to the finger-and-thumb process.

A learner's muscles are easily cramped, and the temptation to use finger and thumb is, at first, great, but by determination and perseverance the muscles are hardened, and the strain overcome.

Some milkers are in the habit of drawing the teats downwards to such an extent that the whole hindquarters of the cow are kept in constant motion. There should be very little downward pressure—it should be mainly horizontal. When milking, there should be practically no movement of the arms, except such as is caused by the action of the muscles, and the teats should be pressed against the hollows of the hands by the tips of the fingers. Many milkers entirely encircle the teats with their fingers, but a moment's thought will serve to show that this is an incorrect position, because the outlet from the udder is only a very small tube in the centre of the teat, and it stands to reason that the pressure should be exerted on this part principally, and not on the teat as a whole. The hands should enclose more of the udder towards the end of the milking, until the last drop is drawn.

Of course, I am perfectly aware that the milker's patience is often severely tried, and it is more than probable that the poet who writes so charmingly about the milkmaid and her duties, was never inside a cowhouse during milking time, in early spring, when the pastures are young and lush.

Clean, expeditious milking not only increases the yield of milk and butter-fat—it also develops the udder, the result being a gradual increase in the flow of milk. It will not, of course, make a bad milker into a record-breaker. Quick milking is a good test of milking abilities, and results in the largest possible quantities of milk, with the highest percentage of fat, and there is plenty of evidence to prove that the variations of fat contents of milk are to some extent due to bad milking, whether by machine or hand.

Milking three times a day is sometimes a necessity, but, speaking generally, little is gained by it. No farm employee is so worthy of a good wage as an efficient milker. Although his work is not laborious, his hours are long, and his duties apt to become monotonous.

Stripping.

There is great variance of opinion as to the necessity, or otherwise, of stripping. The result of my own experience, which is a very long one, has led me to conclude that if a cow is once thoroughly milked, no good can be done by stripping; but where there is a number of milkers, some of whom are not trustworthy, stripping is a necessity, and where the milking machine is in use, it should never be omitted.

A careless employee may milk until he can get no more, but his indifferent manner of milking will cause the cow to hold up some of her milk, which the very best stripper cannot make her yield up.

If a cow has sore teats, she requires the greatest patience in handling, and no treatment of the sores will yield good results, except they are thoroughly washed and dried in the first place.

Some cows have very hairy udders, and the unavoidable pulling of the hairs, in the process of milking, causes much irritation, but this may be entirely prevented by the free use of a pair of clippers. Many cows also suffer much, just after calving, from hard, swollen udders, and nothing will cure this as quickly as persistent hand rubbing. An aperient medicine will also be of service.

PAINTING ON THE FARM.

SURFACES REQUIRING SPECIAL TREATMENT.

In the painting of farm buildings there are often materials to be covered for which the paint used for timber is not suitable, such materials including cement and galvanised iron.

The paint ordinarily used for house painting should not be applied to new cement, which contains an alkali which will cause the paint to lie on the surface in a treacle-like form—that is, it will not dry, but always remains in a wet, sticky condition.

Untreated cement work should not be painted until it is about two years old except with cold water paint, lime wash, or one of the proprietary lines of paint specially manufactured for the purpose. If desired it can be prepared for ordinary paint by applying two coats of sulphate of zinc. When dry the surface should be brushed down to remove all crystals; it may then be painted in the ordinary way. A very satisfactory priming coat for weathered cement work may be had by mixing one part of red lead to two parts titanium zine paste.

Asbestos Cement Sheets.

The foregoing references to cement apply more or less to asbestos cement sheets, for they are principally of cement, and although they contain considerably less free lime, it is inadvisable to paint them when new with ordinary paint without special treatment. It is advisable to allow the sheets to weather for about twelve months and then apply a coat of equal parts of genuine turpentine and hard oak varnish. If to this, a coat of paint consisting of one part of red lead to three parts of titanium zine is applied, a first-class foundation will be provided for further painting.

In the case of internal surfaces, a coat of preparatory liquid will prepare them for one or two coats of cold-water paint, or the even more pleasing flat oil paint, many attractive shades of which are now available. Cold-water paint may be applied externally in lieu of oil paint if desired. For this purpose it will be necessary to add about one-quarter of a pint of raw linseed oil to the gallon of water paint.

For ceilings, kalsomine is recommended in lieu of cold-water paint. It often happens that repeated applications of this latter material begin to crack and peel off in a very unsatisfactory manner. This cracking does not occur on the walls to anything like the same extent.

Galvanised Iron.

Under the heading of iron may be included roof iron, guttering, downpipes, tanks, and water pipes. In all these instances the iron is galvanised to prevent it rusting, so that, to some extent, painting is only necessary after the galvanising shows signs of wear. Guttering, downpipes, &c., are usually painted for appearance immediately the building is completed, and with one good coat only. It is better not to paint the roof iron until it has been exposed to the weather for a few years. Because of the continual contraction and expansion due to the extremes of heat and cold, and the want of a good grip or key, ordinary house paint is not suitable. It is always advisable to use a high-grade paint specially manufactured for the purpose.

Formula for Whitewash.

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better, as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will “curdle,” a condition tolerated only by inexperienced and indifferent workmen. Before the lime commences to boil fiercely add tallow or common fat in the proportion of about 1 lb. to 14 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.—“A. and P. Notes,” N.S.W. Department of Agriculture.

Answers to Correspondents.

Testing for Tuberculosis.

J.O. (Stanthorpe)—

The Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., advises that the tuberculin test will not seriously affect the milking of your herd, but bailing the cows up every third hour for a period of eighteen hours to take their temperatures after treatment may affect the milk supply, but only very slightly.

Phosphorus Deficiency in Cattle.

J.H. (Pomona)—

Your inquiry as to the amounts of the ingredients to add to a 100-lb. bag of bonemeal as a lick for stock was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises as follows:—

The cattle undoubtedly suffer from want of phosphorus, and no other ingredient like iron, gentian, &c., is at present required. Bonemeal may be used if sterilised, but I recommend crushed Nauru phosphate, which is so much cheaper and contains much more phosphoric acid.

Mix 1 part of salt with 2 parts of Nauru phosphate or bonemeal. You can sprinkle a little molasses on the mixture to make it more palatable. No extra lime is required, and would really be harmful.

BOTANY.

The following replies have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Soudan Grass—A Useful Fodder.

V. and Son (Miriam Vale)—

The specimen of grass forwarded with your letter is the well-known fodder Soudan Grass (*Sorghum sudanense*), which should be a valuable grass for your district, either as green forage or for hay. Like all, or practically all, grasses of the *Sorghum* group it develops at times a prussic-acid yielding glucoside, and caution should be exercised in feeding it to stock, especially stock that are empty and inclined to gorge themselves on it.

Sterculia quadrifida.

R.A.D. (Orkadie)—

Sterculia quadrifida is a tree widely spread throughout Queensland, but it cannot be said to be common in any one spot, and I do not know a common name for it. It is a beautiful tree when in fruit, and the seeds that are removed from the black coating and the inner coating are edible and of a pleasant flavour when fresh.

Macrozamia.

P.B. (Harlin)—

Macrozamia spiralis is commonly known as Burrawang, Wild Pineapple, Zamia Fern, and by other names. It belongs to the family Cycadaceæ, the oldest family of living flowering plants.

In *Macrozamia* the male and female flowers are borne on distinct plants, and both in heads or cones, the cones being composed of a number of scales. In the female cone each scale bears on its lower surface two ovules which later develop into bright red seeds. In the male cone the scales bear on their lower surface innumerable anthers full of pollen.

The plants are generally regarded as poisonous and are very common in parts of Queensland and New South Wales. Another species is common in Western Australia. They cause rickets or staggers in stock. However, the stem, particularly in those species which form a fair-sized stem, contains a lot of starchy matter which can be boiled and used for stock food, the heat apparently destroying the poisonous principle.

Those backward Cane Crops

On account of too much rain earlier in the year and too little later, the growth of both plant and ratoon crops is backward.

¶ Growers would therefore be well advised to apply a little extra fertilizer to push them along, so that they will be in a sufficiently forward condition to harvest next season.

¶ A liberal application of Shirleys Cane Fertilizers before the cane gets "out of hand" will result in a big increase in the tonnage per acre when the cane is harvested.

¶ This is sound practical advice, and growers would do well to follow it.



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A Real Live Monthly

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Prospects, and also Your State.

Poisoning of Stock.

J.T. (Maryborough)—

The specimen forwarded with your letter has been identified as *Rivina lœvis*, a tropical American plant very common as a naturalised weed in the scrub areas between Gympie and Maryborough. It gives a very unpleasant taste to milk, but apart from that it is not known to possess any harmful properties.

The other plants you mention—the Wild Passion, Wild Peach, and *Solanum Seaforthianum* (Nightshade)—are known to be poisonous, but in these scrub areas it is often very difficult to trace the poisoning of stock to any one particular species. If the *Solanum* has been eaten, I should think it was the most likely cause of the trouble.

PIG RAISING.

The following reply has been selected from the outgoing mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton:—

Lack of Vitamins and Mineral Matters in Food.

C.C.E. (Cloyna)—

Your boar is suffering from a lack of mineral matters and vitamins in his food, and is generally lacking in bowel and bladder action.

Treatment must first aim at cleaning out the digestive tract and removing any accumulation of undigested food. For this purpose prepare five grains of calomel and one teaspoonful of sugar; mix this in a small ball of moistened pollard and feed to the boar early in the morning. About twenty-four hours afterwards give two ounce packets of Epsom salts in one pint of fresh milk; give this as a drench to ensure the animal taking the full dose. This should effectively clean out the bowels. Feed very lightly on nutritious, appetising food, of which more than half should consist of green lucerne, pumpkins, sweet potatoes, and skim milk. Very little grain is required but allow plenty of clean drinking water and compel the boar to take regular exercise daily. On the third day of the treatment add to the food one dessertspoonful of Nauru phosphate (finely powdered) and ten grains of boracic acid, giving a small quantity of food only when these drugs are being administered. Give the phosphate and boracic acid in one pint of fresh milk in a clean trough.

Mix the phosphate and boracic acid as dry powders first, then add a small quantity of milk to make a paste and thin down with balance of milk for use. Continue with the above for fourteen days; after that add one dessertspoonful of Nauru phosphate daily in one pint of fresh milk.

WORLD'S BIGGEST PLANE.

The acceptance by the Royal Air Force of the world's largest aeroplane, the Beardmore "Inflexible," upon its passing all the official tests, brings to light a remarkable story of the British general strike.

The biggest tyres and landing wheels ever built were ordered for the machine from Fort Dunlop just before this prolonged industrial dispute, and, naturally, there was nothing to go on in the way of design. It was a new problem demanding special tools and machinery at a time when many of the sources of supply of raw materials were shut off.

First it was found that in this size the normal type of wheel with spokes was impossible. The technical department at Fort Dunlop had therefore to face the production of an altogether new type of wheel. They had to reject much of the available raw material as quite useless. When the new wheels were finally in being, a special testing machine had to be built for them, because they passed far beyond the limits of any such machine already in existence.

Their breaking load was, in fact, over 48 tons, an astonishing victory in such a time of emergency, and the tyres required for them were of record size—400 mm. by 2,250 mm., or about 16 inches by 7½ feet in diameter.

General Notes.

The Role of the University.

"A University is one of the instruments by means of which new ideas and groups of ideas find organised expression; it trains collaborators who work out the implications and corollaries of new ideas; through a network of personal influence it carries new ideas into the professions and public services. In the main a University is mediatory rather than originative, critical rather than constructive. Its strength lies in winnowing new ideas, in interpreting discoveries and disclosures which others have made, in colouring by slow degrees the texture of educated opinion. These are the duties for which the characteristic structure of the modern or modernised University is especially designed."—Sir Michael Sadler.

Northern Pig Board.

The Minister for Agriculture and Stock (Hon. W. Forgan Smith, M.L.A.) advises that the following nominations for election as members of the Northern Pig Board have been received:—Frederick Henry Hyde, Peeramoon; Charles Alfred Hough, Tolga; David Johnston, Malanda; Robert Thomas Croker, Malanda; Robert Campbell, Peeramoon. As five members are only required, no election will be necessary.

Messrs. Croker, Johnston, Hyde, and Campbell are sitting members of the present Board, which terminates on the 31st December, 1928.

Saving Money.

There are many ways of saving money, but one of the best, since we have to spend it on occasion, is to see that we spend wisely, thereby saving pence, shillings, and in many cases pounds that would otherwise go to the other fellow.

In the matter of purchasing household supplies, wire netting, iron, and the many items that are used on farm and station considerable saving can be effected by dealing with the Queensland Pastoral Supplies Ltd., the well-known providers in Bowen street, Brisbane, who supply the public direct.

A glance through their advertisement, which appears elsewhere in this issue, will prove this. Catalogues listing many lines will be forwarded post free on request, and it will certainly pay any producer who has not already received one to write for a copy immediately.

Staff Changes and Appointments.

Mr. F. W. Dunster, of Toowoomba, has been appointed an Officer under and for the purposes of the Animals and Birds Acts.

Mr. G. Cross, of Goonaro, Hebel, has been appointed Honorary Inspector of Stock.

Constable J. H. Teichmann, of Pentland, has been appointed Inspector of Slaughter-houses.

Mr. G. A. Cameron, Police Magistrate, Townsville, has been appointed Chairman of the Inkerman, Kalamia, Pioneer, and Invieta Local Sugar Cane Prices Boards. *vice* Mr. T. R. Kennedy, Police Magistrate, resigned.

Mr. D. McLaurin, Temporary Inspector under the Diseases in Plants Acts, has been admitted to the Public Service and, together with Mr. S. A. Green, Clerk of the Department of Agriculture and Stock, has been appointed Inspector under the Diseases in Plants Acts, as from 1st November, 1928.

Mr. C. C. Parkinson, of Coorparoo, Brisbane, has been appointed Inspector on Probation, Agricultural Bank, as from 24th September, 1928.

Messrs. James Arthur Kerr, Foreman of the Stock Experiment Station, Townsville, Max Rose Muller, Temporary Inspector of Stock, Kingaroy, and Stanley Crawford Allan, late of Keeroongooloo, have been appointed Inspectors on probation under the Diseases in Stock Act. Messrs. Kerr and Allan will be in the Helidon Cleansing Area, and Mr. Muller in the Burnett district.

Messrs. W. H. Stobbs and K. R. Hack, of Nerang, have been appointed Honorary Inspectors under and for the purposes of the Diseases in Plants Acts.

Queensland Butter Achieves Remarkable Distinction.

Many dairy associations have been awarded prizes of merit at the dairy show recently held at Islington. The competitions were open to manufacturers of butters within the British Dominions, and there were seventy-five entries made in one class. The Co-operative Dairy Association, Gayndah, was successful in gaining the third place of merit in the Salted Butter Class, but it was in the Unsalted Butter Class that Queensland manufacturers achieved remarkable distinction. In this class the Oakey Dairy Association gained the first award. The Maryborough Co-operative Dairy Association was awarded third place, and the Downs Co-operative Dairy Association was very highly commended on the exhibits manufactured at Dalby, Goombungee, and Toowoomba factories. The results indicate that the manufacturers of butter in this State are continuing to maintain a high standard of quality and are sparing no effort to further improve that standard wherever it is possible to do so. The good reputation that is enjoyed by Queensland dairy produce on the overseas markets will be further enhanced as a result of the success that has been achieved at this important competition at the Dairy Show at Islington.

Valedictory—Mr. C. W. Shenton.

The officers of the Department of Agriculture and Stock assembled on Friday, 9th November, to bid farewell to a fellow-officer, Mr. C. W. Shenton, who has resigned from the public service after eleven and a-half years' service in the Department.

The Under Secretary of the Department, Mr. E. Graham, when presenting Mr. Shenton with a handsome eight-day clock on behalf of the officers, referred to his efficiency in carrying out the duties which had been entrusted to him, and to the popularity and esteem in which he was held by all members of the staff. He very much regretted that the Department was losing the services of such a promising officer, and wished him every success in his future career.

The Under Secretary's remarks were supported by Mr. S. S. Hooper, accountant, in whose branch Mr. Shenton had been employed during his term of office. Mr. Shenton suitably replied.

Control of Banana Weevil Borer.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) has drawn attention to the recent return from Java of an officer of the Entomological Branch of this Department. The officer in question (Mr. J. L. Froggatt) was sent to Java in May of this year primarily with the object of conducting an investigation into the question of the control of the banana weevil borer in that country. As it was believed that natural enemies played an important part in controlling this highly destructive insect, particular attention was devoted to that aspect of the investigation.

Mr. Forgan Smith said that as a result of Mr. Froggatt's work colonies of two enemies of the borer had been introduced to Queensland. One of these enemies was the maggot of a fly which is believed to be of material assistance in reducing borer infestation in the Dutch East Indies, and he was pleased to be in a position to state that a colony of this beneficial insect had already been liberated at Cooran. The other beneficial insect had not yet been liberated, and it is still being handled in quarantine in accordance with the precautions considered necessary in introducing such insects.

Emphasis was laid on the fact that although it was hoped that the introduced insects would eventually be of material assistance to the banana-grower in his fight against the borer, immediate relief could not be expected. Even if the natural enemies do become permanently established in the field, some considerable time must elapse before they have bred up in sufficient numbers to exercise an appreciable degree of control. In the meantime, therefore, Mr. Forgan Smith strongly recommends banana-growers to enthusiastically adopt the control measures recommended by the officers of his Department, and in particular to extensively use the poison baits for the destruction of the adult borer or beetle.

Mr. Froggatt also investigated other factors responsible for borer control in the Dutch East Indies.

The Minister further stated that a number of new varieties of bananas had also been brought back from Java, and these would be grown in strict quarantine for not less than two years. This precaution was being taken in order to eliminate, as far as is humanly possible, the danger of introducing further pests or diseases with the new varieties.

Lucerne—Use the Cultivator.

Lucerne sown in autumn should receive no cultivation until the following spring at earliest. The young plants are tender, and will not stand rough handling. On friable, loose soil, especially, the effect of cultivation would be to pull many of the plants out, and consequently the harrowing must be light, and should not be attempted until the roots have firm hold; but after the second cut, particularly on ground that sets hard, the harrow can be used.

The method of keeping early spring weeds in check is to mow frequently. The mower should be put over the crop before any of the weeds have commenced to flower, and the operation should be repeated a month or two afterwards. Two mowings will generally be sufficient. They must not be omitted if weeds are getting a foothold, even if the lucerne is not ready to cut, as the object is to destroy the weeds. If the quantity should warrant it, the cut material can be raked for green feed, but if left on the ground it makes a useful mulch.

Once lucerne becomes well established its vigorous growth keeps most weeds in check, but a certain amount of cultivation is necessary. A rigid-tine cultivator is the most suitable implement. The lucerne fields should be given a thorough stirring with this in July or August, and, if necessary, again later in the season. The loosening of the surface allows moisture to percolate to a greater depth, and prevents it from flowing away over the surface. Owing to the depth to which even light showers then penetrate, less loss occurs through evaporation.

If a rigid-tine cultivator is not available, a springtooth cultivator can be used very effectively if fitted with narrow tines specially designed for the cultivation of lucerne fields.

Obituary.

The untimely death of Mr. George Sutherland, B.Sc., A.A.C.I., on the 23rd October is generally regretted. Mr. Sutherland was engaged in the chemical laboratory of the Department of Agriculture and Stock for several years prior to his illness, and was formerly an officer of the Income Tax Office and of the Aborigines Department. He was well known at the Queensland University, where he achieved fame by his brilliant successes. During the war he enlisted and served his country on the fields of France and Egypt. It is generally felt that Queensland has lost a much-respected and highly-esteemed young scientist in the passing of Mr. Sutherland, and widespread sympathy is extended to his wife and family.

Hints on Soldering.

The materials necessary for soldering are one or two soldering irons, some sticks of solder, a bottle of muriatic acid (spirits of salts), and a small block of sal ammoniac. A handy container for the fire in which to heat the irons can be made out of an empty benzine tin or oil drum by cutting out the top, punching a few holes in the bottom, and cutting a hole in the side within an inch or so of the bottom, so that the heads of the irons can be passed through into the fire.

To prepare to solder, pour into a bowl (glass or ware—not tin or galvanised-iron) a quantity of the spirits and add a few pieces of zinc to "kill" the liquid. The soldering iron is first heated to a dull red heat, a fair portion of the point is filed clean, and this portion (while the iron is still hot) is rubbed with the sal ammoniac. The clean point is then tinned—that is, coated with solder—and this is of great importance if good work is to be performed later. To tin the iron, run a little solder on to a piece of clean tin, alternately turning its point in the melted solder and dipping it in the killed spirits.

Before using the soldering iron, clean the joint to be soldered, and with the aid of a brush put on a little of the killed spirits. The iron should be hot enough to make the solder run freely, but do not let it get red-hot. Withdraw it from the fire, brush the point of the iron on the joint to be soldered and move it slowly along, supplying solder as required by placing the end of the solder stick against the iron near the point. When soldering a loose patch, it will be found convenient to run a drop of solder on to the joint first, then hold the patch firm with the aid of the solder stick while the iron is operated to make the patch firm. The edges of any joints to be soldered should be fitted neatly and closely together, and the solder should run freely and adhere almost as if it were part of the tin.

Arrowroot Board and Arrowroot Flour.

The Governor in Council has approved of the issue of a notice notifying his intention to place arrowroot flour under the control of the Arrowroot Board. Provision to permit of this was made in "*The Primary Producers' Organisation and Marketing Act Amendment Act of 1928.*"

Any petition for a poll to decide whether or not this Order shall be made must be signed by at least fifty growers or manufacturers of arrowroot, and must reach the Under Secretary, Department of Agriculture and Stock, Brisbane, before the 18th December, 1928.

For the purposes of the petition, an arrowroot grower is one who has supplied arrowroot bulbs grown by himself to any arrowroot mill in Queensland at any time during the past twenty-four months, and an arrowroot manufacturer is one who has manufactured arrowroot flour at any time within the past twelve months.

Banana Suckers Affected with Bunchy Top.

Some little time ago a deputation of banana-growers waited upon the Minister for Agriculture and Stock (Mr. W. Forgan Smith) at Parliament House in connection with the matter of the eradication of banana suckers affected with Bunchy Top from the plantations owned by them at Camp Mountain.

During the discussion on this matter a suggestion was made to the effect that, provided the Minister would arrange that the inspectors under the Diseases in Plants Act would go through the plantations simultaneously with a working bee which would be constituted by the growers, the latter would forthwith carry out the destruction of any suckers infested with Bunchy Top. Some half dozen plantations were situated within the area over which it was intended the working bee should operate.

The Minister has since received a report from his officers advising that the work of eradication of Bunchy Top plants has been effected in six plantations comprising an aggregate area of about 105 acres. The working bee has been effective and has achieved its objective. From a Departmental point of view the results from the working bee are satisfactory. It is understood, however, that some of the growers found that on account of the fluctuation in the area under bananas on the individual farms there was difficulty in arranging the work on an equitable basis. The varying percentage of affected plants in the plantations added to this difficulty.

As far as is known, this is the first occasion on which a working bee has been constituted for the purpose of cleansing a group of plantations of different ownership of Bunchy Top.

Graze Succulent Feed with Care Conditions Conducive to Bloat.

Bloat, or hoven, is due to succulent foods eaten under certain conditions which cause the formation of large quantities of gas in the rumen or paunch, and in consequence a swelling of the left flank. It is most often seen (a) when cattle are turned hungry on to such succulent green food as lucerne, clover, &c.; (b) when cattle used to dry feed are suddenly changed on to green, soft food; (c) when travelling cattle are allowed access to large amounts of green food, such as variegated thistle; (d) when cattle gorge themselves on wet grasses or herbage; and (e) when cattle are fed on roots or potatoes under certain conditions. Some animals appear to be more subject to hoven than others.

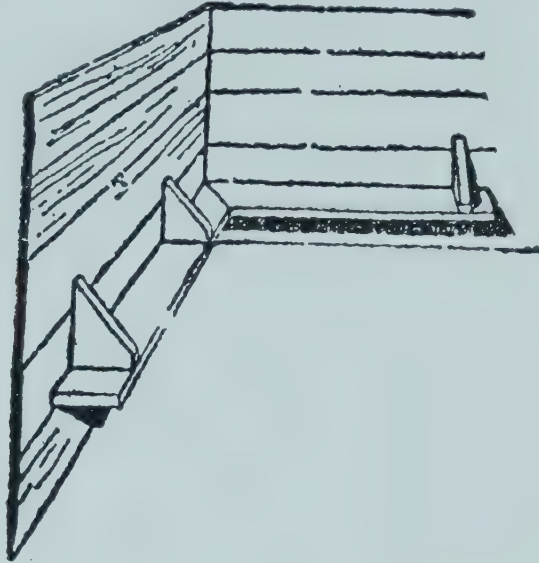
Keeping the mouth open with a gag, or a piece of wood, until the beast has belched most of the gas by mouth will be useful in mild cases. The internal administration of 1 oz. of bicarbonate of soda and 1 oz. of ginger is sometimes useful, and it may be repeated in a few hours if necessary. In a bad case the most effective treatment is the puncture of the paunch. This is done on the left side in the flank—at a point equidistant from the last rib, the edge of the loin bones, and the angle of the haunch. The correct instrument for this purpose is trocar and cannula.

The cannula is a tube through which passes a sharp-pointed instrument—the trocar. This instrument is thrust into the rumen, and the trocar is withdrawn, leaving the cannula in place, and through this the gas escapes. In case of emergency a knife may be used in the same way, the gas escaping through the cut; but complications may set in and cause death if this is not done expertly. After the gas has escaped the animal might be given a dose of linseed oil (1½ pint) and turpentine (1 tablespoonful). This mixture should be well shaken up while being given.

Every effort should be made to prevent the occurrence of hoven in stock. In feeding lucerne and clover, if the animals are not used to it, they should be put on it gradually until they become accustomed to it. If lucerne is fed in a wet state, or after heavy rain—when it is soft and juicy—it will almost always produce trouble; and cattle should, therefore, be kept off it until it is drier.—"A. and P. Notes," N.S.W. Ag. Dept.

A PROTECTION RAIL FOR YOUNG PIGS.

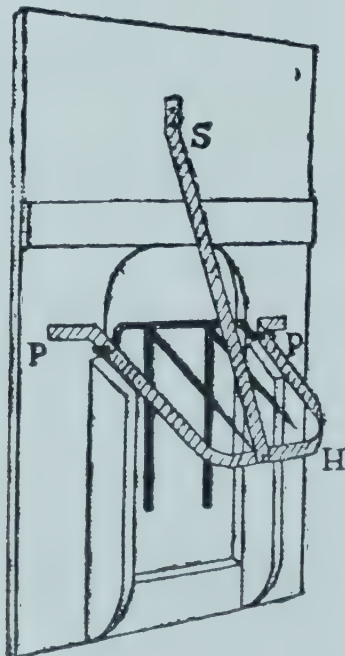
The simple device shown here is often the means of saving many lives. A 2 by 4 inch or a 2 by 6 inch piece of timber is placed about 8 inches above the floor of the farrowing pen, and nailed firmly to the side walls in the manner



illustrated. The sow's body may go against the side of the pen and strike the rail or fender, and if a little pig is there he has some chance of not being squeezed to death, because the rail keeps the weight off him.

SAFEGUARD AGAINST FOXES.

An ingenious fox-excluder for outlying poultry houses in use in Lincolnshire, England, was illustrated in the "Farmer and Stockbreeder," from a sketch supplied by Mr. A. Tyler, country poultry lecturer for Lincolnshire. The two vertical iron rods in the entrance hole are attached to a crossbar which pivots at PP and



also carries a two-spiked rod in such a way as to allow the birds to enter without injury, but would preclude the entrance of anything the length of a fox. The crank in the pivoted bar serves to reduce the effort required to push the rods into a horizontal position. Danger to other stock is obviated by hoop-shaped guard, H, braced by the stay, S.

The Home and the Garden.

MATERNAL AND INFANT WELFARE.*

While pondering on what aspect of the above subject—the most vital of all Australian problems to-day, as it seems to me—I happened in my evening paper on a glowing tribute to the British constitution under which it is our good fortune to live.

The speaker is Premier Taschereau, the French-Canadian leader in the province of Quebec. Sprung from a nation once the bitterest of our enemies and the formidable rival of England in the titanic struggle of a hundred years for mastery in the colonial world, that statesman, now proud to be a subject of the King, glories in eloquent words in the charter of our liberties.

“The British constitution,” says he, “wherever applied, is the most perfect governmental instrument that man has ever devised, making for liberty in its truest meaning, justice on its broadest lines, and peace under its most acceptable form.”

A special virtue of our constitution is that, though the best ever, it is still in the making; growing from age to age, to a higher level of completeness. And another essential fact is that, inspiring it all, and animating its evolution, is the soul of a people, with great traditions in the background of history, and, if it prove true to itself, with a glorious message of peace and goodwill for the future of the world.

The Answer.

But, you may ask, what has this to do with the domestic function of motherhood and the nursing of babes? The answer is, it has everything to do with that. It is our duty and privilege to maintain this race in its purity, its lofty motives, its passion for freedom, its humanity. Many times has it drawn the sword to crush the oppressor and proclaim enfranchisement to them that were bound. For centuries the eyes of all nations have turned to it as the ensample and Paladin of Liberty.

A Vital Factor.

And we should never forget that a sound motherhood is the most vital factor for the true prosperity of any people; while, conversely, no deeper injury can be dealt to the body politic of Australia than that we should so far fall from grace as, by any malign activity, or any defect of duty, to suffer injury to reach the mothers and children of the nation.

Unfortunately, great injury is now being incurred by death and disease among these, the most precious assets of the State and the family, considered from any standpoint—humane, moral, spiritual, economic. The family is the basis of our civilisation. On its wellbeing hangs the fate of Australia present and to come.

On these grounds I prize the opportunity of laying my views, formed not without some care and pains, before the country women of New South Wales through the organ of their association. There are two agencies in this State to which all women owe a debt of gratitude—the public Press and the statisticians.

For the last seven years, since I first wrote on maternal welfare in the journals, the Press generally has given liberal space to the discussion of this subject. “Country Life” has been specially generous.

Most politicians seem incapable of understanding; or, at all events, show no zealous interest; and the general public is indifferent or indolent, except when roused under the lead of a group of energetic women. But the pressmen at once grasped the meaning and national importance of the welfare of motherhood. A journalist is ready to listen; and, if he approves, will espouse a public cause and speak his views aloud.

* From “An Open Letter to Any Country Woman,” by A. Watson Munro, M.D., in “Country Life” (Sydney).

Of the Statisticians.

Of the Government statisticians I can say, after considerable experience in Commonwealth and State, that I am deeply impressed with their impartiality and eagerness to get and give information.

They will not make statements except on the plain facts and figures. They form an invaluable factor in civilisation. One might say, in an important sense, that statistics are civilisation.

Improving Visibility.

And here let me clear away, to begin with, some obscurity that exists in the minds of many women, regarding the accuracy of the statistics of maternal mortality.

Quite recently, a member of parliament, having read some of my letters in the Press, took great interest in the figures quoted. He asked some questions. One was: "May it not be that the mortality figures cover more than actual maternal mortality—that is, more deaths than are directly the result of childbirth?" Here is my reply.

"The Answer is, Decidedly No."

Let me explain the meaning of a few terms. The term "childbirth" when used by statisticians and authorities on public health signifies the whole tale of gestation, starting from conception, on through pregnancy and parturition (delivery), right to the end of convalescence of the mother. And accordingly, by "mortality of childbirth" we mean the death of a mother at any point along that line of events.

If you consult official statistics, you will find a table of the various "causes of death" in childbirth. That list is based on the Bertillon system of classification, which is now used by the various European nations and Japan. By using it, we are able to make comparisons on a common basis, giving due allowance (as we always must, in human operations) for variation in some details of compilation; thus France, for example, differs from British countries in the definition of "stillbirth."

Childbirth.

Remember (looking at the list of causes referred to) that women do not die simply of childbearing at the full term of pregnancy. What they die of is the complications thereof. Childbearing is a natural (physiological) act., analogous to the other vegetative functions of all living beings, such as swallowing or digestion or excretion.

But all these functions may be perverted by disease. Childbirth may become "pathological" or complicated; as by neglect of Nature's laws, of commonsense, of proper nourishment. Thus rickets, a dietetic disease of girlhood, and it may so deform the pelvis (the bony tunnel through which the infant travels) that in later life ordinary delivery is impossible.

Also, woman (like man) has "sought out many inventions." On the patient's part I mention unhealthy living, regimen, eating and drinking, dress; and (alas!) on the part of some obstetricians, male and female, a tendency to treat labour as if it were a disease, and resort to interference with its gradual and natural course.

Troublesome Tinkering.

Such tinkering with the divinely planned mechanism for the perpetuation of the human race is practised mainly through ignorance, following on superficial study and defective practical training.

Ignorance will always peddle and fuss, where knowledge would "look before and after." Ignorance in action is an appalling spectacle. It has often led to disaster in human affairs. Warnings against this error, which seems to be on the increase in midwifery work, have lately been raised, again and again, by leading obstetricians here and in the homeland.

KITCHEN GARDEN.

A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in covered seed beds, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

FLOWER GARDEN.

To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet fox hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription—one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Orchard Notes for January.

THE COASTAL DISTRICTS.

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured; using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit

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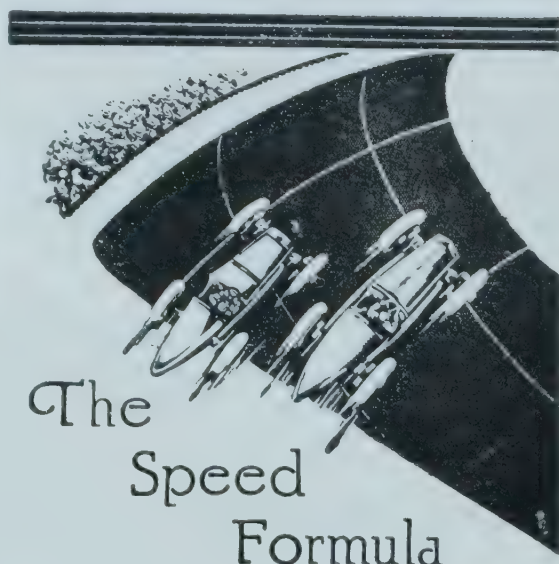
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is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show off to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of his fruit are to hand, that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then "why spoil the ship for the ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

- 1) That the fruit must be fully developed, but yet quite firm when gathered.
- (2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.
- 3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.
- (4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, mphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the

same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both “grain” and “saccharine” sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping “lay-out” to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter’s friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

THE STORY OF PNEUMATIC TYRES.

It is exactly forty years ago since John Boyd Dunlop applied for the patent for the first pneumatic tyre. He had just retired from his veterinary practice in Belfast, the largest one in Ireland, where twelve horse-shoers worked for him.

While a boy at school in the village of Dregghorn, Ayrshire, his native place, Dunlop observed that a large wooden roller was easier to pull than a smaller one, because, as it had a larger area of surface bearing on the ground, the pressure on each unit of area was less.

For years he thought on the idea of wheels with flexible rims that would flatten out and so increase the area of contact with the road. It was a complaint from his small son Johnny, then nine years of age, which actually materialised in the first rubber tyres to be filled with air. Johnny had grumbled about the difficulty of riding on thin solid tyres over the uneven stone setts of Belfast’s streets.

His father thereupon made two air tubes from sheet rubber one thirty-second of an inch thick, fixed them to a wooden disc with a thin strip of linen, and blew them up with a football pump. The tyres were then fitted to a tricycle made by Dunlop from American elm to his own design with specially shaped rims. The whole was completed one night at ten o’clock, and so eager were both father and son to test the new device that the boy went out for a run in the moonlight and returned triumphant at midnight.

When a racing cyclist who was shown the novelty expressed his doubts about it, the inventor challenged him to a race on his thin solid tyres against the nine-year-old boy on the home-made tricycle equipped with pneumatics. It was the first of the unending tale of races to be won on Dunlops. Although John Boyd Dunlop revolutionised cycling, and made motor cars possible, he himself could not at that time ride a bicycle; indeed, there is no record that he ever rode one all his life.

A VALUABLE REFERENCE JOURNAL.

A Theodore settler writes—“I would be glad to have whatever back numbers of the “Queensland Agricultural Journal” you can spare, for I consider them very valuable for reference, no matter how old they are.”

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.**AT WARWICK.****MOONRISE.**

Date.	December, 1928.		January, 1929.		Dec., 1928.	Jan., 1929.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	4.50	6.32	5.1	6.49	p.m. 30.44	p.m. 11.14
2	4.50	6.32	5.2	6.49	11.10	11.43
3	4.50	6.33	5.3	6.49	...	...
4	4.50	6.34	5.3	6.50	a.m. 12.8	a.m. 12.13
5	4.50	6.35	5.4	6.50	12.41	12.43
6	4.50	6.35	5.5	6.50	1.12	1.15
7	4.50	6.36	5.6	6.51	1.42	1.48
8	4.50	6.36	5.6	6.51	2.12	2.26
9	4.50	6.37	5.7	6.51	2.41	3.10
10	4.51	6.38	5.8	6.51	3.15	3.58
11	4.51	6.39	5.9	6.51	3.48	4.51
12	4.51	6.40	5.9	6.51	4.28	5.44
13	4.51	6.40	5.10	6.51	5.14	6.41
14	4.52	6.41	5.11	6.51	6.3	7.40
15	4.52	6.41	5.12	6.51	6.56	8.37
16	4.52	6.42	5.13	6.51	7.50	9.36
17	4.52	6.43	5.13	6.51	8.46	10.34
18	4.53	6.43	5.14	6.51	9.46	11.33
19	4.53	6.44	5.15	6.51	10.43	p.m. 12.34
20	4.54	6.44	5.16	6.50	11.49	1.38
21	4.54	6.45	5.16	6.50	p.m. 12.40	2.46
22	4.55	6.46	5.17	6.50	1.42	3.53
23	4.55	6.46	5.18	6.49	2.47	5.3
24	4.56	6.47	5.19	6.49	3.55	6.7
25	4.56	6.47	5.19	6.49	5.8	7.4
26	4.57	6.47	5.20	6.48	6.17	7.53
27	4.57	6.48	5.21	6.48	7.24	8.32
28	4.58	6.48	5.22	6.48	8.26	9.10
29	4.59	6.48	5.23	6.47	9.19	9.41
30	5.0	6.49	5.24	6.47	10.2	10.13
31	5.0	6.49	5.25	6.47	10.40	10.43

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

4 Dec.	) Last Quarter	12 31 p.m.
12 "	☉ New Moon	3 6 p.m.
20 "	(First Quarter	1 43 p.m.
27 "	○ Full Moon	5 54 a.m.

Apogee, 11th December, at 7 18 p.m.

Perigee, 26th December, at 12 30 p.m.

The Moon when making a complete revolution about the earth in December will, apparently, be among the stars of Cancer on the 1st and 2nd, of Leo on the 3rd and 4th, of Virgo from the 5th to the 8th, of Libra from the 8th to the 10th, of Scorpio on the 10th and 11th, of Orpheus on the 12th and 13th, of Sagittarius from the 14th, to 16th, of Capricornus on the 17th and 18th, of Aquarius on the 19th, of Pisces on the 20th, of Cetus on the 20th and 21st, of Pisces on the 21st, of Aries on the 23rd and 24th, of Taurus from the 24th to 26th, of Genisis on the 27th and 28th, of Cancer on the 28th and 29th, and of Leo on the 30th and 31st.

When apparently in Leo on the 3rd and again on the 30th the Moon will pass within 5 degrees of Neptune, which is still near Regulus, but invisible without a telescope.

Saturn and Mercury will be passed on the 12th when the Moon is new and invisible.

On the 16th, when passing Venus about 9 a.m., an interesting daylight spectacle may be obtained, the crescent Moon and the beautiful planet being in the east-south-east.

On the 26th the Moon will occult Mars about the time of rising; and a small star in Taurus about an hour or so later.

Mercury will be on the far side of its orbit almost directly behind the Sun on the 18th, and only one degree above its upper edge at noon; it will therefore not be noticeable this month.

Venus will set at 9-23 p.m. on the 1st and at 9-35 p.m. on the 15th.

Mars will rise at 8-36 p.m. and set at 6-18 p.m. on the 1st. On the 15th it will rise at 7-20 p.m. and set at 5-29 a.m.

Jupiter will rise at 3-34 p.m. and set at 2-48 a.m. on the 1st. On the 15th it will rise at 2-33 p.m. and set at 1-53 a.m.

Saturn will rise at 5-58 a.m. and set at 8-30 p.m. on the 1st; it will be in conjunction with the Sun on the 13th and therefore rise and set with it.

3 Jan.	) Last Quarter	4 34 a.m.
11 "	☉ New Moon	10 28 a.m.
19 "	(First Quarter	1 15 a.m.
25 "	○ Full Moon	5 9 p.m.

Apogee, 8th January, at 1-42 a.m.

Perigee, 23rd January, at 9.48 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]



*A Famous
Actor—*

*Mr.
Leon
Gordon*

*praises a
Famous
Shaving
Soap—*

Rexona

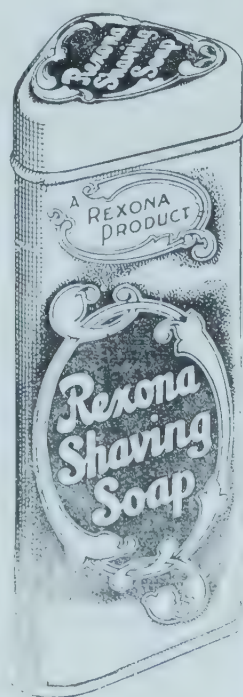
"Having used Rexona Shaving Soap for some period, I have no hesitation in stating that it is the most excellent Shaving Soap for a quick and smooth shave." (Sgd.) LEON GORDON.

**Men! Try "A Better
Shave"**

See how easily you can take off a stubborn beard without the least trouble, no matter how tender your face is, by using Rexona Shaving Soap, the new triangular stick. It is a neutralised Soap with the fresh out-door fragrance of Rexona itself.

Softens the Beard, soothes the skin, and gives you just what you want—"A Better Shave" every day.

Rexona Shaving Soap
The Triangular Stick



1/6

Abbreviated Notice. ARROWROOT POOL.

A notice appears in the *Government Gazette* of the 17th November, 1928, notifying the intention of His Excellency the Governor to make an Order placing Arrowroot Flour under the control of the Arrowroot Board.

Any petition for a poll to decide whether or not this Order shall be made must be signed by at least fifty growers or manufacturers of arrowroot, and must reach the undersigned before the 18th December, 1928.

A grower, for the purposes of the petition, is a person who supplied arrowroot bulbs grown by himself to any arrowroot mill in Queensland at any time within twenty-four months prior to the date of the holding of the referendum, and a manufacturer is a person who manufactured arrowroot flour at any time within twelve months prior to the referendum.

Full particulars can be obtained by reference to the *Government Gazette* or by application to—

E. GRAHAM, Under Secretary,
Department of Agriculture and Stock, Brisbane.

Abbreviated Notice. Extension of Operations of Egg Board.

An Order in Council appears in the *Government Gazette* of the 17th November, 1928, notifying the intention of His Excellency the Governor in Council to extend the operations of the existing Egg Pool from the 1st January, 1929, to the 31st December, 1933.

The existing Egg Pool applies to all owners of fifty fowls or upwards in that part of Queensland to the east of a straight line drawn from Bundaberg to Goondiwindi.

Any petition asking for a poll to decide whether or not the proposed extension shall be made must reach the undersigned by not later than the 18th December, 1928, and must be signed by at least ten per cent. of those owners of fifty fowls or over who have supplied eggs to the Egg Board.

Nominations will be received by the Returning Officer, Egg Board Election, care of the undersigned, until the 18th December, 1928, for election for one year as growers' representatives on the Egg Board. Five such representatives are to be elected, and each nomination is to be signed by at least ten growers who own fifty fowls or more. The following districts shall each return one representative:—

- No. 1 District.—From Caboolture to Bundaberg.
- No. 2 District.—From North Brisbane to Caboolture.
- No. 3 District.—South Brisbane, Wynnun, and Cleveland.
- No. 4 District.—West Moreton, Logan, Southport, &c.
- No. 5 District.—Darling Downs, Stanthorpe, &c.

Full particulars can be obtained by referring to the *Government Gazette* of the 17th November, or upon application to—

E. GRAHAM, Under Secretary,
Department of Agriculture and Stock, Brisbane.

Department of Agriculture and Stock,
Brisbane, 6th December, 1928.

ABBREVIATED NOTICE.

Extension of Operations of Broom Millet Board.

An Order in Council appears in the "Government Gazette" of the 8th December, 1928, notifying the intention of His Excellency the Governor in Council to extend the operations of the existing Broom Millet Board from 11th March, 1929, to the 31st October, 1931. The existing Pool applies to all broom millet produced in Queensland.

Any petition asking for a poll to decide whether or not the proposed extension shall be made must reach the undersigned by not later than the 9th January, 1929, and must be signed by at least 10 per cent. of growers engaged in the production of broom millet and who supply their product to the Broom Millet Board.

Nominations will be received by the Returning Officer, Broom Millet Board Election, care of the undersigned, until the 9th January, 1929, for election for one year as Growers' Representatives on the Board. Two such representatives are to be elected, and each nomination is to be signed by at least five growers of broom millet.

Full particulars can be obtained by referring to the "Government Gazette" of the 8th December, 1928, or upon application to

E. GRAHAM,
Under Secretary.

Department of Agriculture and Stock,
Brisbane.

Queensland Cement & Lime Coy. Ltd.

City Office:
A.M.L. & F. Coy's Bldgs.,
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'Phone—
Central 4123
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**Best, say experts. Hardy—Exportable—
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For best seed and plants—

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WILT RESISTANT TOMATOES

*Result of Comparative Trials carried out by Mr. N. A. R. Pollock,
Northern Instructor in Agriculture, 27th June/26th Sept., 1925.*

Variety.	lbs. per plant.	Variety.	lbs. per plant.
Denisonia	- 64.45	Norduke	- 37.35
Bowen Buckeye	56.45	Roselawn	- 37.15
Norton	- 41.75	Columbia	- 31.85

Large firm fruit, good colour and shape, splendid shippers. Packets, 6d. and 1/-; per ounce, 5/-

J. T. MOORE, TOMATO SEED GROWER, BOWEN, Q.

Departmental Announcements

IT is hereby notified that the "Journal" will be supplied to all members of Agricultural and Horticultural Societies in Queensland who do not derive their livelihood solely from the land on payment, in advance, of an annual subscription of 5s., which will include postage. Queensland Schools of Arts will be supplied free of charge on the prepayment of 1s. per annum to cover postage. Persons resident in Queensland whose main source of income is from Agricultural, Pastoral, or Horticultural pursuits, which fact should be stated on the attached Order Form, will receive the "Journal" free

ON PREPAYMENT OF 1s. PER ANNUM to cover postage.

To all other persons the annual subscription will be 10s., which will include postage.

All remittances should be made by postal notes or money orders, but where they are unobtainable stamps will be accepted, though the Department accepts no responsibility for any loss due to the latter mode of remittance.

For your convenience an Order Form is attached. A cross on the first page of the "Journal" indicates to the recipient that his subscription is again due. Watch also the wrappers on the "Journal."

Amount of one year's subscription should be forwarded with Order Form before the 15th of the month to the **Under Secretary**, Department of Agriculture and Stock, Brisbane.

All new subscriptions or renewals received for the "Journal" after the tenth day of the month will commence with the month after that on which the subscription is received. Previous copies available will be supplied at 6d. per copy to subscribers only. To all others 1s. per copy.

ORDER FORM.



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Print Surname legibly in **BLOCK LETTERS.**

Please
write
Plainly.

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To the Under Secretary,
Department of Agriculture and Stock, Brisbane.

For the enclosed please forward
me the "Queensland Agricultural Journal" for year.

My main source of Income is from _____
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NOTE.—Subscribers who wish to obtain the Journal for the month when the subscription is ~~sent~~, must apply before the fifteenth of that month.

The Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

Secretaries of Associations are requested to be good enough to forward to the Editor, as early as possible, the dates of forthcoming Shows, as it is important in the interests of the Associations that these dates should be published. Changes in dates must also be promptly advised.

To enable recipients of the "Queensland Agricultural Journal" to have the half-yearly volume bound, Covers in Boards and Cloth will be supplied from this Office on application to the Under Secretary for Agriculture. Applications must be accompanied by a remittance to cover cost. Covers will be supplied at **One Shilling and One Shilling and Ninepence** each.

In order to avoid disappointment, correspondents who wish for replies to questions in the "Journal" are requested to note that it is imperative that all matter for publication on the first day of any month should reach the Editor by the 15th of the previous month.

We would ask our Subscribers to note that, when their Subscription has run out, a **Cross** is placed on the first page of the "Journal." It often happens that this intimation is disregarded, with the result that the "**Journal**" is **not posted** to the Subscriber. The Department cannot guarantee to supply back numbers in such cases.

Pamphlets on different subjects relating to Agriculture, Horticulture, and Stock are issued by the Department, and may be obtained **gratis**, on application to the Under Secretary.

Farmers who wish to **Advertise** products, &c., in this "Journal" should address all inquiries in relation thereto to the Government Printer, Advertising Branch, Brisbane.

Advertising that will Pay!

The Queensland Agricultural Journal has a State-wide circulation, and is the medium of success to all our clients. The publicity will render a good account.

For full particulars apply to—

THE GOVERNMENT PRINTER
(Advertising Branch)
GEORGE ST., BRISBANE

Marketing Wool to Assist Farmers

The Minister for Agriculture and Stock, in order to assist farmers who carry not exceeding 1,500 sheep upon their holdings, to obtain the best prices for their wool, is prepared to receive such wool on owners' account, classify it, and place it upon the market so that it will not be sold under the star-lot conditions as it has usually been sold.

A correct account of the wool will be kept and each farmer will receive the amount received for same, less the necessary charges, which will consist only of the following:—

1. A charge for classification of 10s. per bale.
2. All freight, handling, dumping, and rebaling.
3. Other out of pocket expenses.

No commission will be charged, and if required an advance of 60 per cent. will be made by the Department of Agriculture and Stock upon the estimated value of the wool as at the time of receipt of the wool in the Department's Store.

The wool will be sold at the first wool sales following a sufficient accumulation to enable a bulk sale to be made.

It must be understood that the limit of this arrangement is 1,500 sheep, and that the Department will not accept a clip from a greater number.

Farmers desiring to accept this arrangement should notify the Under Secretary, Department of Agriculture and Stock, of their intention before consigning their wool, advice of which, with all particulars of brands, weights, &c., should be given.

The weights as taken in the Departmental Store, and the classification before sale, to be accepted as being final.

RECOMMENDATIONS.

(a) The bales should be branded on the cap only, so that the same packs, if in good order, may be used again. This saves the price of a new pack to the farmer.

(b) The wool requires no other treatment on the farm other than the removal of dags before rolling the fleeces.

(c) Locks and belly wool should be kept in separate packages.

E. GRAHAM, Under Secretary,
Department of Agriculture and Stock.

DEPARTMENT OF LABOUR

(CONTROLLED BY THE STATE GOVERNMENT).

NO CHARGES—NO FEE.

Central Labour Exchanges have been established at Cairns, Townsville, Rockhampton, Bundaberg, Brisbane, Ipswich, and Toowoomba.

Employers who are in need of Labour, and Employees who are looking for work, may have the services of the "Free Exchanges" by using the Letter Cards supplied without charge at all Post Offices, or otherwise communicating their needs to the nearest Exchange.

WOMEN WORKERS.

An Employment Agency for all classes of Women Workers is conducted at The Labour Dept., Edward St., Brisbane. The Agency has for its purpose the better organisation of the Market for Women's Work. Employers are invited to call, write, or wire the Manageress, who will give immediate attention to all applications and inquiries. Women Workers desiring employment of any kind are invited to enrol their names at the Agency.

NO CHARGE IS MADE FOR THE SERVICES OF THE AGENCY.

The Agency deals with all classes of occupations for Women, including Home Work, Educational Work, and Employment in private houses, Offices, Shops, Hotels, Restaurants, Workrooms, and Factories.

F. E. WALSH, Director of Labour.

Stability—Service—Satisfaction

State Government Insurance Office

Life Insurance in force - £8,340,000.

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ALL PROFITS BELONG TO POLICY-HOLDERS.

Our Agent will be pleased to furnish all information.

Branches and Agencies in all Queensland Towns.

Head Office: George and Elizabeth Streets, Brisbane.

JOHN A. WATSON,
Commissioner.

(4)

